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NOTE BY THE SECRETARY.

The Lomb Prize Essay on Practical Sanitary and Economic Cooking Adapted to Persons of Moderate and Small Means, which was awarded the first prize of five hundred dollars at the Milwaukee meeting of the American Public Health Association, is now in press and will soon be ready for distribution. The members will be notified by circular when the essay is issued.

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I.

THE PRESIDENT'S ADDRESS.

By CHARLES N. HEWITT, M. D.,
Of Red Wing, Minn.

The great quadrennial contest, from which we have just come, was not enough, with its party cries and artificial excitement, to bury out of sight and mind other more important, and ever-present, problems which are constantly pressing for consideration and solution, and which affect very closely the welfare of individuals, the family, the community, and the state. Even the fact that we are stronger than ever as a nation; that the balance of trade is in our favor; that our finances are sound; that we are at peace while other nations threaten war; that pleasant preachers in all places speak pleasant things; and some of the most serious of these problems are beneath the surface,—all these, and other influences, are not enough to keep thinking men and women from minding the proof that there are other things which *ought* to be, and therefore must be, studied and cared for, with as much zeal and faithful persistency as we show in pursuing and enjoying pleasant things.

Many of these problems confront the health officer, and those who, with him, either as individuals or as organizations, are working to sanitary ends. Every one of them relates to causes at work to diminish health of body, mind, and morals; to increase disabling sickness and the chance of premature death; and, while lessening bread-winning power and disposition, to increase expenses, and induce worry, recklessness, despair, sickness, temporary or permanent disability, according to the physical condition, temper, training, or surroundings of the individual. They lessen the disposition, and opportunity, for healthy pleasures; they tempt to wrong thinking and bad doing; injure or make impossible the family and the home; foster other modes of living; and concentrate undesirable populations in great centres, by so much increasing the dangers unavoidable in such centres, to themselves, and to the country population. We all know something of the problems to which I refer, because they touch the individual life of most of us. There is no one who is not directly concerned with some of them, and very few, of adult years, who have not been wounded, in health or in happiness, by one or more of their causes.

If we could take a census of us who are here to-night, it would be to determine, not who has suffered, but who has suffered most frequently and most severely; how many have been hopelessly wounded; how

many have been the occasion of such injury to others; how many have attempted to get at these evils, or their causes; how many have taken other than selfish thought about them; how many are willing, if the way can be shown, to unite for patient and aggressive work? I feel, as president, for the time being, of this great Association of professional and lay workers for public health, a weight of responsibility in this opportunity for public speech. I wish I dare limit myself to the saying of pleasant things, or to such topics as make up the average of public addresses, and which compose, flatter, amuse, soothe, help to pass a pleasant hour, and leave nothing but a pleasant memory. But I dare not, nor do you expect it. We are here for business,—urgent and important business,—about which there is little to flatter our pride or quiet our consciences. There is but one way to make our undertaking of to-night other than a meditation on death, and that is, to remember that our work in this Association is to combine the efforts of all who will help, to realize, on this continent, in the lives of its peoples, the practice of hygiene, which is "to secure for all the most perfect action of body and mind so long as is consistent with the laws of life; to help all to make growth more perfect, decay less rapid, life more vigorous, death more remote." This summary by one of our great leaders, gone on to his reward, is an epitome of Public Health. By it we mean that body of knowledge, both as a science and an art, which teaches the conditions upon which man may attain the highest, longest, most efficient and enjoyable exercise of all his powers. Note the breadth of the field covered by the definition, for it includes all we know of the environment of the race, all influences of whatever sort which in any way affect, or may be made to affect, the welfare of man,—beginning so far away as the sun, including heat, light, electricity, and the atmosphere with its conditions; the influence of mother earth and her products,—soil, water, vegetable growth and decay, with the swarms of animal life below man; then in his own sphere, the influence of race, heredity, locality, education, family and home life, society, religion,—in fine, all that which makes possible, and grows out of, what we call our civilization. I have named but a title or two of the catalogue of these influences, but enough to show what an encyclopedia the written science of health would be; and for the simple reason that all knowledge has, of necessity, a direct bearing on human welfare, and that the welfare of the individual is bound up in the welfare of the whole, while that of the whole may be easily, and is constantly, affected by the suffering, as by the deliberate act of the individual. If, as is not unlikely, the indigestion of a ruler or prime minister has plunged a nation into war, it is a much more frequent occurrence that the sickness of an obscure person—a tramp, if you please—has started a train of direct results which inflicted on a people a worse than war—a pestilence—and brought misery, sickness, death, with a host of other evils, in its train.

Now, as all knowledge ought to contribute its quota to Public Health, so it is just as true that health—well-being—whether of individuals or of

nations, has, as an object of study, many points of view and many ways of approach, and so is known and called by a variety of names. Some of them suggest nothing on the subject, as we are viewing it to-night; and so, because the relation is not recognized, the teachers and pupils of more than one department of knowledge are often found in the ranks of the opposition to our work.

Is it doubtful, if the principles, teaching, and practice of the Master were the actual guides of the majority of His professed followers, that a long list of causes of ill-health, disease, and premature death would be struck from the catalogue we are now compelled to keep? Education, whether public, private, general, special, whatever the classification, is, when true to its name, a form of sanitary work, and affords for our purpose as good illustrations as can be found that culture, training,—any of the various ways of drawing out and using human faculties,—must proceed, to be successful, on the fact that they all inhere in a body, the physical basis of their activity. Is it not true that most of the failures, personal, social, and in other directions, have been caused by the one-sided, and so deformed, character of development and growth? What is extravagance in thought, word, or deed, but the eccentricity born of unbridled powers, in abnormal, and by so much unhealthy, action? What better security for well-being and well-doing, than available means of avoiding such excess, and, when necessary, making their use obligatory? Take any of the evils associated with our civilization, but better, take its own increasing artificial character in illustration: test it by your own experience: did you ever try to separate the essentials from the non-essentials in your daily life of worry and work, pleasure and grief, and study them in their bearing on your health or your efficiency? Try and see how many customs and habits have grown into your very being, till it seems like removing a piece of yourself to cut one off. Then figure out what sacrifices you have repeatedly made to retain something of food, drink, clothing, of temper or appetite, which you knew was an injury to you. If you think such things a trifling draft on your vital forces, prove it by a business balance of your account with life. Find out what your vital investments are, and what would be their real value if you were compelled to-night, *now*, to realize on them. Take stock of your environment, inevitable and assumed, and of all other things, so far as you know, which are, have been, or are likely to be, drafts on your vital income, or capital. If you have ever tried to do these things honestly, you have gone but a little way before you have made the appalling discovery that you cannot do it. You find yourself, like a little child, spending an income, and possibly encroaching on capital, often ignorantly, thoughtlessly, and at times recklessly, of whose real value and amount you have no true measure. These facts make it difficult for the wisest and most prudent to escape many a penalty which he would choose to avoid. How must it be with the average of men and women?

The mortality, and sick-rate, tables are the professional record; but how utterly inadequate the expression of the amount and effect of the

physical failures, which must be added in, to form any conception of the loss they register.

Having thought in some such way as I have suggested, of our individual needs, come a little further and let us imagine a community, made of such people as yourself, none any worse or any better. Try and imagine what such a community would reply, if asked to join in our quest of to-night. How much do you know, or care to know, of the means best adapted to make the average of sickness and death the least possible in your own community, and what will you do to use them for that purpose? Does any one answer that your knowledge is confined to what you have learned in the sanitary care of yourself and family, and so is, of necessity, of little use beyond? Very well;—now apply that admission to the community we are imagining, and see how it affects the prospects of coöperation among its citizens in the direction we propose. The people know little of hygiene except it be what they have been compelled to learn for "self or family." "The health of the community is the care of the board of health, not of the citizens." Now it is easy to see what I am aiming at. It is to ask your attention to some of the difficulties which we health officers encounter in the attempt to secure intelligent, popular coöperation in the public health service.

If a community, made up of as intelligent citizens as we have supposed, is not going far in this direction, what is the prospect for less favored localities? Some one might reply, as many another has done, when urged by zealous health officers to come out of their shell of selfishness and hold up the hands of their local board,—"If others will take care of their houses or other property, and of their families, as well as I do of mine, there will be less sickness and suffering. I am not bound to teach others what they have the same opportunity to learn that I had. You health officers have more power than any other officials. Use it. It was given you to be used on just such people as you ask me to help you *persuade* to do what you have abundant authority to *compel* them to do. Excuse me, doctor, but if you attend to the duty we pay you for, you will have less occasion to ask me and others, who have our own business to attend to, to go outside our work and make enemies by meddlesome interference with our neighbors' affairs." That is not an exaggerated statement, but just what I have heard many a time, as have numbers of my brethren here. I doubt if there are many of our friends who think, till it is put before them in this way, what a discouraging truth this fact is. In a long experience I have known some of the best health officers in our country resign their places, not because they feared the danger, the trouble and anxiety, or even because of small salary, but because the representative people of their districts gave them scant encouragement and less support, without which the most capable and zealous man, with all the powers the law can give him, is handicapped in his work. And the greater his authority and responsibility, the greater his isolation and his need.

I shall have done much if I can persuade our friends that what Public Health, as an art, needs most to-day, is, not more special legislation to increase the powers of properly organized boards of health, but something which legislation cannot compel, and which is of infinitely more value, the intelligent, hearty, and constant interest in the subject by all classes of the people, but particularly by those whose support will enable it to strike telling blows against disease and death in and for the homes of the people. We want the mothers to be the health officers of the home. We want the fathers on our boards of health, and mothers, too, I hope, ere long. We want their counsel, their support, and we promise to repay the loan with compound interest to them and to their children. To the question, What has Public Health done to justify this demand and this promise? it is no longer necessary to recount, as of old, the abstract benefits which it ought to confer; but we reply, Look around you. For years the evidence has been piling up, by the daily results of its work, and it has grown to such proportions that it is an admitted and leading factor in the longer average of life, and freedom from great plagues, which is the characteristic of our century. It is the trusted counsellor of every civilized government, and makes safe the rapid intercourse of nations and people, and a concentration of population never before known. It is the protector of public, family, and personal well-being, as no other human institution can hope to be.

Taking a lower and business view of Public Health, we may claim that as an investment of time, study, and money, it "pays." Millions of money are already invested in public sanitary work by the popular vote, and private enterprise finds its pecuniary reward in the same direction.

So we are far beyond the place we occupied when, in 1872, this Association was founded, to unite popular and professional efforts for the furthering of public welfare, as a useful and every-day helper of healthful, successful, and happy living.

The question is no longer why, but how, we may help. And it is the leading duty of this Association to answer that question. We have come to this point in our discussion, I trust, in hearty accord, and are ready to ask, What shall I do to be saved from wasting and disabling sickness, chronic ill-health, and premature death? Let us begin by changing the form of the question, and include all men, particularly they of our own households and communities. For you cannot get far in the search for personal or family safety, in the way of Public Health, before discovering that the real horizon of the field is that of the nation, and that far from weakening your grasp of the art for personal, family, or local use by knowing that fact, your grip will be stronger, your vision clearer, your footing firmer, your judgment more trustworthy. From the broader field you will get a better knowledge of causes and methods, impossible in the more limited one. I assume that the heads of a family ought to have a more direct personal interest in public health than the health officer, unless he be a father too. This seems a strong statement

at first; but it rests on the truth that the knowledge how to avoid sickness, prolong life, increase efficiency, and by so much add to the sum of healthful enjoyment, should be the common property of all, and the bounden duty of parents. One need know but little of the science of numbers to master the art of their use in the business of life. We need not know the methods of the signal service to use its forecasts of weather, nor the science of the electric current to avail ourselves of its use for light, or other expenditure of its power for our comfort or convenience. It is just as true of the science of Public Health as respects the benefit an individual or a community may derive from the use of its art in every-day life. It is this practical distinction between the science and the art which clears the way for popular coöperation in matters of health, and makes it possible for all who, seeing the advantage and the duty, will join us in our quest of to-night.

There is a popular misunderstanding as to the qualifications and duties of health officers and boards of health, which should be corrected. Their more public work, consisting of the enforcement of law and regulation, the making inspections, controlling infectious disease by isolation and disinfection, collecting vital statistics and the like, has helped people to the belief that public sanitary work is largely and chiefly of a police and clerical character. It is a very serious mistake, and must be gotten rid of by any one who is anxious to know the truth of the matter. A health officer who had no other ambition than that, would aim to perform a very important part of his official duty; but it would be, nevertheless, the mechanical part of it, much of which he could train a clerk to do nearly as well. A cook who is a master of his work would scorn to take so low an estimate of his duty as that. He is an artist in that he mixes his routine labor and formulas with the needed measures of skill, taste, tact, and seasoning, not only in the preparation of standard foods, but in devising new combinations to tempt and satisfy the appetites of his employers. Just so, but in a higher and broader field, the competent health officer, by a thoughtful study of the most mechanical detail of his work and by an accurate knowledge of its every capability, may make the dryest statistics interesting, and extract from his daily routine, means to stimulate the interest, satisfy the inquiries, and educate in sanitary ways, the people whom he serves. Such men are representative of the official use of Public Health as an art; they do not serve the forms and tables of their official work. A return, whether of a birth, of a death, of a nuisance, or of an infectious disease, no matter what, if it only relate to the subject, has more than a legal or statistical use, in the hands of such a man. He may use it to impress an important truth on an individual, a family, his medical brethren, or the community. It may be a hint to himself of a new view of an old fact, or the pointer which spurs him on to a new advance in practice, a new research, or another trial of an old method. With so much to learn, to teach, to do, and to bear, the life of a competent, well trained, and faithful health officer is a varied and constant demand for diverse duty, in

the office, the laboratory, the library, in quiet routine, or in the broil and turmoil of a panic. It is a sort of reflex of the sanitary needs, gains, and losses of his people. Such men are the persistent inoculators of sound sanitary knowledge, faith, and practice. They are leaven,—leavening others, but gaining power by use. They keep abreast of others' effort by diligent reading and observation of original work, assimilating established truth, converting promising modifications of old methods into practice, and readily devising means of proving the claims of encouraging new theories by the touchstone of trial. They are very likely to join some branch of original search, sometimes as a relief to the monotony of routine, but oftener because they are driven, by the urgency of their own needs, to be impatient of the slow movement of the advance, and rush to the picket-line to see and feel the enemy, and very likely do a little skirmishing, if opportunity offer. But despite the impatience of results, natural enough when human life is concerned, as it constantly is in their work, you will find such men conservative by bitter experience, though never failing to welcome any reasonable prospect of advance; and once satisfied of the justice of a trial, they get about it with the energy born of a love of their work, and are cordial in approval if it prove a success.

Another common mistake, which it will help us very much to have corrected, is the idea that the work of the health officer is beyond common apprehension and interest. So it is if your health, that of your family and your community, are unaffected by sickness, infirmity, or premature death; if there are no invalids in your homes. If you are free of all these things and in no danger of infection or nuisance from without your borders, you certainly have no occasion to think of Public Health, nor its servant, your health officer. That blessed state will be yours at the millennium, not before. No other branch of human effort so constantly teaches that you are your brother's keeper, and he yours, and in a more intimate sense than one would suspect who had not studied it, or than one would choose who had the power to select. So, whether we wish it or not, Public Health as an art is the bounden duty of every intelligent person, judging by the most narrow of standards—selfishness. But do not study it from that point of view: think of it, rather, first as a business matter, with your other insurance against loss; then think of it as helpful in solving the great social and political problems which worry us, and demand solution. Their importance all admit, and that all the available help should be used to prevent or control admitted dangers. Try Public Health. It is the object of this Association to make these truths known to all who will listen, and to concentrate the efforts of all who will help. We have come here from Canada and from almost every state in the Union, to compare notes taken in every field which Public Health, as an art or a science, cultivates. Our single purpose is to prove our claim to be doing useful and necessary work, to increase efficiency, and to ask the hearty coöperation of all who will help to make the life of all longer, more useful, healthier, and happier. Will any who

hear me to-night join us in the attempt to realize our quest? There is room for every talent, stimulus to the most phlegmatic, and abundant reward for all the time, talent, and effort which any one will devote to this mission: it is a mission second only to that of the Master, whose teaching and example find illustration and explanation here, for it rests on the common basis of a pure and good life in a pure and healthy body.

A brief retrospect will, I think, afford a suitable background for the short review I offer to the Association of certain questions relating to our common work.

As secretary of one of the oldest of the state boards, I had the honor of an election as an original member of this body, and have known its history since. In my own state, beside, I have been missionary at large, and served as the organizer and counsellor of many a local board, and as sanitary inspector and health officer as well. I have seen our organizations grow from two feeble boards with ill-defined powers, in 1872, to over fourteen hundred, united under a common code of law, with largely increased powers, duties, and funds. There is not to-day in Minnesota a community, however small, without such a board in direct communication with the state board.

The state boards of health have increased from three in 1873, to thirty-one in 1888. Largely through their efforts, popular knowledge and confidence have grown from the tentative methods of the past to the demand for, and more liberal support of, sanitary organization and positive work. More and better legislation, great sanitary engineering works, and a bountiful crop of private enterprises in the same direction, are among the evidences that our field is widening and our responsibilities increasing. We have seen the early examples of efficient state executive organization become a living force in many more of the states and Canada. Various departments of modern science are our willing helpers. Microbiology has opened up great stores of discovery, and awakened great hopes, which we trust may not fail. We have seen the beginnings of international coöperation for the crushing out of cholera, yellow fever, and other epidemics, which must in the near future become a beneficent reality, taking its place with arbitration, in international disputes, as the most valuable victories in our century.

Interstate coöperation between state boards of health will, from our present experimental beginnings, have a growth determined by conditions, which I refer to later on. It must rest on the broad foundations of thorough local organization and efficiency, as they, in turn, rest on popular education by experience, which successful sanitary work is now giving throughout our land. All this and more shall be the reward of a faithful use of the opportunities now open to us. But pleasant as is the memory of what has been well done, and bright as the future ought to be, there is no lack of what the doubters call discouragements, but which the wise recognize as natural stimulants to more and better work. I do not propose to rehearse the catalogue: the grumblers

do that. But there are a few matters to which I crave your attention, as their settlement is necessary to the next step forward.

The first essential of any sanitary authority, now, is executive power, and its systematic use in the regular and scrupulous performance of every-day duty, as defined in the law and suggested by every-day experience. This almost self-evident proposition is constantly neglected in legislation for organization, and is very frequently violated by boards of health, who seem to favor the popular idea that an exceptional occasion is necessary to the highest exercise of their power, and infectious diseases of the classical type are their selection, with a proper admixture of panic. Panic is no advantage any longer, if it ever was, as a help to sanitary organization and work. Infectious diseases are not the leading causes of our sickness and mortality. It is only in the exceptional severity of plagues like yellow fever, as it has prevailed in Florida, for example, that infectious disease counts the most victims in the sickness or death-roll. That epidemics prevail at all, in our time and country, is somebody's fault; for if there is one thing more than another that modern hygiene ought to be able to do, it is to forefend their attack, or control them if they effect a lodgement; and boards of health and health officers have to learn that the most public and pronounced activity, after the invasion of infectious disease, is no substitute for the quiet, unobtrusive work which, in daily faithfulness, would have detected the first case, and controlled its spread. This waiting for "something to turn up," for a suitable opportunity for doing something worth while, is the prolific excuse and occasion for a multitude of little neglects which make the life of such a board no more than suspended animation waiting the electric shock of an emergency to seem to live. Its work is spasmodic, unsteady, and superficial; nothing is *forehanded*—a word which, better than any other I know, expresses the duty and activity of a model board of health, and is as applicable to that of a hamlet as of a city. As a rule, it is true that it is the fault of the sanitary authority if panics accompany epidemics. It is to prevent both that such authority exists; and the absence of one, or both, is the best test of the worth of a board to the locality or state which it serves. Nothing so conduces to this efficiency and popular confidence as the state of readiness for anything, which the systematic performance of daily, and often seemingly trivial, duty helps to assure.

Another pressing need is a better classification of causes of death, for sanitary purposes, to which should be added causes of sickness and of permanent ill-health from disease. At present our professional nomenclature is as vague, sometimes, as the popular one. Cholera infantum, and heart disease, are little more accurate than "too weak to live," a common popular cause of death under one year. The general divisions of the English registrar-general's tables are the best I know; but some of the sub-divisions are not satisfactory. Some of us who have charge of the matter, in the various states, can go back of the returns for more accuracy in nomenclature. I find that the address of the attending physician (which appears on our returns), when there was one,

makes possible more particular inquiries, and the profession have, as a rule, courteously responded. We have, in Minnesota, compulsory notification of infectious diseases of men, and domestic animals, to the local boards, and by them to the secretary of the state board. For the diseases of men, the vital statistics and notification, as above, serve as mutual checks, and the last has the strong support of the profession and people alike. Some of our best physicians notify me of infectious diseases which they encounter, and have repeatedly enabled me to crush out infection before its work had fairly begun. A pathetic side of this matter is the occasional appeal from anxious mothers, warned by experience, for protection, which is sure to follow as fast as the speediest available means can carry the order. But the best system of statistics and notification falls far short of its purpose if there is not a way of making the facts so obtained of the most immediate and practical use for health officers. I have arranged to publish our vital statistics monthly in the most convenient form for consultation, as all other facts, correspondence, and reports bearing on every department of our work, in "Public Health in Minnesota," a monthly publication, begun March, 1885. Ours was the first venture in this direction. Other state boards are now doing something similar, and I think it not unlikely that we shall yet find advantage in coöperation in this work at its next stage. We hope, in Minnesota, to add meteorological records, collated with the monthly disease prevalence, in graphic form.

Isolation has become so important and efficient an aid in the control of many diseases, that it is time to devise some changes in our customary methods, which shall insure more thoroughness, with the least interference with the liberty of the family. It is a serious matter to restrain the bread-winning power of a laboring man or of his self-supporting children, and it is a still more serious matter to shut up a suspected family, sick and well, in a small house, when the removal of perhaps a single patient might save the rest, or some of them. The isolation home, under various names, is the ideal method of us all; but if we had one always available, people must be educated to its use. We need it most for diphtheria and scarlatina. In country districts, where our most terrible mortality occurs, a large family in a small house suffers the concentration of the contagion (of diphtheria, for example), so that sometimes not a child escapes the disease, and often death takes most or all of the children, and, as I have known, the devoted mother as well. It happens frequently with us, that by the kindness of a neighbor without small children, or by the good fortune of a suitable building adjacent, we are able to separate the well from the sick. I speak from experience, for a neighbor saved one of my children from diphtheria in this manner. I know of no way in which one able to afford so valuable a luxury could put a small amount of money where it would pay so large a return, as in building and endowing an Isolation Home, where the mother of a child sick of infectious disease would be welcomed to a refuge with her little one, and where other children exposed to infec-

tion could be isolated in comfort and safety till the period of incubation had passed. Such aid would greatly assist in the solution of the problem, how to care for the sick of a family invaded by infectious disease, protect the exposed from further exposure, and save the community from the infection.

Another essential is an apparatus, not too expensive or elaborate, or too heavy for easy movement on wheels, for disinfecting clothing, bedding, and the like, by steam. One to which steam could be supplied by the boiler of a thresher engine would serve our country districts, and the same could be used where steam boilers are available elsewhere. It could be taken to the infected house, charged, closed, and moved to the nearest available boiler, connected, disinfected, and discharged of its contents, with no danger, and at trifling expense.

Still another need, in this connection, is a ready way of disinfecting the sick-room while occupied. Its essential feature should be the removal of the infected air and dust, disinfecting both as they escape, and the introduction of fresh air, so that quantity, temperature, moisture, and movement may be as required by the sick, but all to be done with the most complete protection of the well. The means must be easy, comparatively inexpensive, and available in the average houses of the laboring population. The stove, stove-pipe, or chimney, affords the available means in such houses in cold weather. In warm weather the open fire, gas, or kerosene, might serve to provide the means for exhausting the foul air and introducing that of the open in its place. Add to the simplest form of apparatus (the open fire or stove-pipe exhaust), cleanliness, fresh air, sunlight, thorough inunction, and boiling water for infected clothing of the sick and attendants, and you have a method almost everywhere practicable, which will reduce the danger from such diseases to the minimum, and the mortality as well. I have used it with grand success many times; but it has one serious defect, common to many other really valuable methods of sanitary work,—it is simple, not patented, and involves the constant use of common-sense. I have chosen to approach the measures advisable for any sickness by the route of the infectious class, to emphasize the important fact that the last require the same as the first, plus certain specific precautions.

The very large mortality from non-infectious disease, under five years of age, is, in the light of our present knowledge, no longer tolerable, and boards of health should move now, and positively, for its material reduction. By the last census this mortality was 43.7 per 1,000 of living population for the whole country, while in thirty-one registration cities it was 88.4 per 1,000. The mortality under five years to total of all ages was given as 39.8. The deaths under one year were, for the whole population, 120.9 in 1,000 living, while for the cities it was 267.5. This does not tell the whole story, as the statistics are estimated to fall from 15 to 30 per cent. below the facts. We have no means of accurately estimating *the sickness rate* which accompanies this mortality, but may assume that it is enormous. The life of the child under five

years of age, in all classes, is spent in or near its home, and in most cases almost wholly there; so that we have to look there for the causes of its ailments, and we know that infection finds it there. Now put this series of facts together, and what better popular reason can we give why parents and all thoughtful people should join us in the work of diminishing this literal and preventable slaughter of infants going on all around us? What better argument for persuading physicians to make domestic sanitation a serious study, at least so far as to help us to the facts we need?

Another fact, constantly forgotten in planning our work. The location, architecture, air-space, water-supply, sewage disposal, plumbing, ventilation, warming, lighting, and other sanitary conditions, in the greater number of our homes are what they happen to be or must be, not what they ought to be. And it is as well to remember that the accepted methods of artificial sanitary arrangement, fully carried out, are not alone sufficient. Nor are arbitrary laws and municipal regulations enough. We must begin anew the study of this serious matter, not only to get at the ideal means of prevention or relief, usually not available, but, which is of much more present importance, to find what can be done, under existing irremovable conditions unfavorable to infant life, to minimize or ward off disease cause. We have no right ourselves to wait, nor to permit others to do so, if we can help it, for ideal, or even more favorable, conditions of attack. We must begin now, and in earnest, the renewal of the battle for the children, and push it to a conclusion. We must do it for the simple, plain, and prosaic reason that the causes of disease, deformity, and death, at work on them, are attacking the sources of our national life and vigor. We seem to have forgotten that a prolific race, or mixture of races, is not sure of a proportionate viability, healthfulness, and efficiency in its offspring. We are too apt to confide in our superabundant resources, and need to read a leaf from the experience of other nations, that we may, if possible, avoid making similar failure a part of our own history. It is not so much the hundreds of needless deaths which concern us, as the thousands of children who survive, crippled in physical, mental, and moral power, for life, and more than likely to transmit these unhealthful conditions of living and doing to their offspring in turn. Think, but a moment, of the great contingent added in this way to the increasing numbers of the dependent and criminal classes, and then ask yourself the question, so often asked in scorn, What has Public Health—Hygiene—to do with the great social and political questions which those classes occasion? We can reply with direct reference to facts. What other branch of human knowledge or effort has more? Speaking deliberately, I do not hesitate to claim that of all the obligations binding upon Public Health, and upon us whose duty is to practise as well as to preach it, there is not another more pressing than this, to begin now, and together, with all the aid we can obtain, a study of the causes of this infant sickness, disability, and death, and at the same time begin to use means now ready, and at hand, for the

reduction of the sickness and death-rate. And these known methods will enable a great and increasing reduction immediately. Lest this be thought impracticable, let us fix our aim at the rate already obtained in our best public institutions for dependent little ones, and in many an ordinary dwelling and family. I cannot pass, without hearty and thankful recognition, the various voluntary efforts in this direction, particularly the open-air work. They have done good in ways not intended. They have, for varying periods, brought weary mothers and sick babies into God's open, to feel the pure sunshine, breathe the pure air, come close to Mother Earth and her products, feast eyes, ears, and heart on natural beauty, eat simple and good food, sleep from natural fatigue, and go back the better for the change. But for us the lesson of the results of such work is, that they forecast the time when the poor's only hope of such refreshing shall no longer be human charity, dealing, at the best, a stinted measure, but it shall be the universal recognition, recorded in the statutes of states, that abundant and pure water and air, with plentiful sunshine, and protection from preventable disease, shall be secured by the most efficient means, for all alike as an inalienable right. Until then, Public Health will lack its most natural means of making our quest of to-night a reality.

Turning for a moment to the details of what, for the want of a better name, we call the secondary causes of disease, provision for the disposition of excreta and other animal and vegetable refuse of population and manufactories, is the first to suggest itself, as they directly threaten the purity of the air and the water-supply. It is in them that some of the most common and fatal of special disease-causes find a congenial soil and rapid growth. The first suggestion with respect to their disposal comes to us from nature's own methods in the same direction; and it is self-evident that the nearer we can make our artificial processes approach natural processes, the more certain we shall be of success. The disposal of any of these matters into streams or other sources of water-supply is no longer defensible on the plea of necessity, economy, or expedition. As respects sewage, English experience has, for the longest time, proven the sanitary possibility of its successful disposal upon cultivated land; but the largest and most scientifically worked out experiments are those for the disposal of the sewage of the city of Berlin. Dr. Koch's relation of its complete sanitary success, to the French Commission recently, reads like a theoretical imagination, rather than a plain statement of accomplished facts; and I hope soon to see that statement published for the information of sanitary authorities in this country.

The only thoroughly worked out results of surface disposal of sewage, for a sufficient length of time, in this country have been at Pullman, Ill.; and at my request a report of the methods there in use, with illustrative diagrams, will be made by a representative of the company, who will be able to answer any practical questions which may occur to those interested. For illustration of the chemical treatment of sewage, the city of London is now making an experiment upon an enormous and expensive

scale. The semi-purified sewage enters the Thames, and the compressed sludge is taken to sea, presumably as food for fish. With present experience it is not at all likely that chemical disposition will answer the requirements in this country.

As to the disposal of night-soil, offal, and garbage, the various methods of destruction by fire are now undergoing a thoroughly practical trial, both in this country and abroad, and, under the stimulus of conceded necessity for prompt and thorough disposal, are rapidly becoming more effective and less expensive. The essential law is, Removal of danger promptly and thoroughly; economy, and saving of material for other use, if possible with above condition. In view of the success this method has already attained for the great centres of population, and the probabilities of still further advance immediately, the lack of such provision for small towns having no sewer or scavenger system becomes really the most serious branch of the problem for state boards of health, and one which should receive their serious consideration. In Minnesota, under such circumstances, by the purchase or rent of suitable land for burial, and the introduction of a simple scavenger system, the disposal of offal, garbage, and night-soil is being reasonably accomplished under the regulations and directions of the local boards of health. Provision for the disposal of excreta and the final extinction of the abominable "hole in the ground" is being attempted, with partial success, by the dry-earth system. The matter will, I trust, come up for consideration at one of our sessions, when I shall have some suggestions to make with respect to it, and will furnish our plans to any one applying for them.

I am glad to report an increase, all over the country, of local improvement associations, which, as in my own state, are proving very efficient aids to the health officer. They are pleasant, profitable, and useful object-lessons in sanitation, the voluntary work of citizens themselves, which cannot be too highly commended or too frequently imitated.

Directly related to this question is the control of offensive trades, and the protection of public and private water-supply. To be efficient, these must be the duty of the state and local boards of health acting together for the common purpose. In Minnesota these laws are already bearing good fruit. Massachusetts is in the advance of all other states in these respects, as respects the late action of her state board of health, and owes her success not only to the urgent needs due to her concentrated population and enormous manufacturing interests, but also to the statesmanlike foresight and tact exhibited by her sanitary authorities. Her board has also taken the initiative in dealing with adulterated foods, drinks, and drugs; and I venture to hope that its delegates will take the lead in introducing methods for the consideration of the Association. I may be permitted to say that their success seems based not only upon thorough and scientific methods, but upon the belief that while penalties are necessary for offenders, thorough popular enlightenment as to the real truth in the matter is even more important.

Another subject of increasing importance, and which ought to receive

the immediate attention of the state boards, is *the sanitary relation of certain diseases of animals as communicable to man*, notably tuberculosis, trichinosis, and glanders; and the increasing possibility that diphtheria and scarlatina may belong to the same class. The relations of the diseases of the cow to the influence of milk as food are attracting widespread attention, and, as affecting a very important infant food, deserve an attentive study with reference to sanitary control. On this subject, popular, and certain professional, opinion has as usual gone to extremes. From the use and even advocacy of distillery milk some have come to refuse the purest supply except after boiling, and their foolishness has been an acceptable and pecuniary advantage to the manufacturers of the proposed "substitutes for cows' milk" which fill our markets and are tried on our children. The importance of the subject has resulted in making the control of infectious diseases of domestic animals one of the duties of the state and local boards of health, as in Minnesota, where the experiment has proven eminently successful and satisfactory.

If we are right in asking our non-professional friends to assume the well established principles of public health as settled, and go on to the practice, refusing any longer to be satisfied with the perpetual rehash of elementary facts, with customary platitudes, which so often pass for instruction in our current literature, we should adhere to the same rule. I have not been unmindful of it in choosing the subjects for my address, and have taken those most urgently suggested by my daily experience, which ought to furnish the inspiration for the speaker in this place, and at this time.

Sixteen years of duty, as the secretary and executive of an active and progressive state board of health, have compelled me to unlearn as to learn, to forget as to remember, to delay as to hasten, and, in executive duty, the most important lesson has been that *coöperation is essential to success.*

Intelligent interdependence in our work must find its truest expression in this Association, not merely among official representatives, but between them and all who, in whatever way, are learning or doing their duty in sanitary effort. The object of its organization, in 1872, was to further this interdependence and coöperation, on the common ground of personal and public necessity. Our duty is plain enough. We come here to contribute, and to learn; to bring the results of individual experience, in various departments of a common work, to a common treasury; to discuss, in a semi-judicial way, difficult or doubtful questions of practice; to push the boundaries of our common knowledge, and its successful application, a little further on, in one or more directions; to readjust them in others; and to get ourselves, while helping others to get, to a higher level in the knowledge and use of Public Health.

But it is not in the power of any of us to arrange beforehand what subjects shall demand the attention of a great representative body, like this, at any given time;—that is often done by events which overpower our inclination and compel our action. Such an event was the epidemic of

yellow fever in Florida. It will be described by health officers, who are still on duty in crushing out the infection, which has again worked such ruin and death. It will be discussed by others, who have done duty in confining its ravages to the smallest possible limits outside that state. After such report and discussion, it may be possible to judge, if any one choose, as to the propriety and success of the methods of prevention or control which were used. But it must not be forgotten that it is not so much the history and management of this particular epidemic, in those respects which concern us here, as the greater questions of *local, state, and national control of epidemics, of any sort*, which such events bring into renewed professional and popular discussion, and serve, in a very vivid and impressive way, to illustrate. This view of the subject I am not at liberty to evade.

Confining myself to matters of fact, conceded by all, it appears that yellow fever gets into the South by importation from outside the territory of the United States, and, in the majority of instances, by infected things, from some of the West India Islands, Mexico, and South America. It further appears that Florida was not forearmed with sanitary forces and necessary funds, though abundantly forewarned by her own experience and that of her sister states. A thorough, independent, and fearless inspection of her exposed territory by a state board of health, having the necessary authority and confidence, would have forefended the threatening danger, if possible have discovered and cared for the first case or cases, have kept close guard of the probable line of attack, as of that of distribution, and have given due warning to its own local authorities, and the boards of adjacent states. Florida made no provision for this, but when the disease was publicly admitted to exist, inadequate organization, lack of coöperation between such organizations as did exist, and other causes, including the measures finally adopted, caused much harmful distress and confusion, with accompanying panic and disorder. Neither the panic nor the disorder was confined to Florida, but invaded other states, where organization was supposed to have been sufficient to have dealt with greater emergencies than the dread of this or any other disease. As the epidemic advanced, the aid of the Marine Hospital service was accepted for financial and other assistance. It could not act inside the state without its permission, and was therefore limited to such service as would be accepted. The observation corps, if I may so express it, has been made up of the sanitary authorities of states adjacent to, or in railroad or river communication with, Florida, within the fever zone. Each of these classes is represented here. Looked at from the impersonal stand-point,—the only one practicable here,—this outbreak teaches many more than the people and states directly affected. Besides reinforcing old lessons, it finds, and has helped to make us all, I am sure, more disposed to learn, and better prepared to study anew the problems which confront us, and which must be settled before we can hope for better results.

For the nation and the states the most urgent lesson is *organization and*

efficient coöperation. For this last experience but adds another to the accumulated evidence of the near past, that no state or province on this continent can afford to be any longer without a board of health, officered by experienced men, who have the confidence of the people and governments they serve ; supplied with unquestioned legal authority and sufficient money, and provided with every recognized means for dealing directly, and to the best advantage, with any disease of men or domestic animals, threatening, or actually invading, the state. It must also, and for the same reason, have authority and funds to act with similar authorities of other states, in mutual coöperation, for state and national defence. It will not do to forget the established fact, that epidemics are now to be looked upon as evidences of the failure of Public Health, in organization or administration. That they occur, or spread, is presumptive evidence, when properly qualified authorities exist, that they neglected to take the needed measures, or were unable to take them. I see no escape from this conclusion, except it be shown, in any case, that prevention or control was beyond the resources of our art.

A central state authority, organized and equipped as proposed, will find itself unable to do efficient preventive or restrictive work without thoroughly organized local sanitary authorities in every township, village, and city. And, further, each local board should have the same powers, and proportionate means, as the state board, in the locality it serves. Enforcing the common law, and independent in all purely local administration, the local authorities should be a unit for common purposes, under the state board, of which the control of infectious diseases is a conceded example. The independence of the local boards in matters of purely local concern, so long as they perform the common duty, is an essential part of the plan of organization here proposed. It is necessary for the work and development of such boards, resting on the fundamental and important fact, that every city, village, and township has an individuality of its own, which must be recognized and considered, in the attempt to introduce changes into accustomed ways of thinking and doing, as much in matters of health as in other respects. With this proviso the plan here proposed will, and has, secured an increase of efficiency in every branch of the common work. The legal essentials are, a common code of sanitary law, common to the state board as to the least or the local boards, so that there can be no question of authority, method, or prompt coöperation in emergency, all being bound by the strong bond of common interest, common methods, and common ends. I am well aware of the difficulty of arranging the relations of state and local authorities in sanitary or other matters ; but I am not discussing what is, but what ought to be, to secure the sanitary care of the whole population of a state, by caring for the smallest township, as for the largest city.

Organized sanitary work began naturally in the care for "the great centres of population," and the disposition still is to rank the villages and townships quite low in the scale of public health. I do not remember to have heard, in this Association, a statement of the claims of the country

districts for sanitary consideration, but I have been taught the truth by long experience and actual knowledge of its imperative necessity in my own state. The claims of large towns and cities have had abundant statement here, and it would be superfluous to review their character or importance.

What I wish to do is to show that the township stands in a very important sanitary relation to the rest of the population, whether urban or rural, state or national. I have abundant evidence in all these directions, but select an example, which includes them all, from my recent experience. A Canadian mail steamer (the Parisian of the Allan line) passed inspection at Rimouski on the St. Lawrence, and landed her passengers at Quebec on the 24th of August last. One of them, an immigrant woman, came on to Minnesota, and went to one of the interior townships. On the first of September the first symptoms of small-pox appeared. She was visited by many of her friends and neighbors until September 7th, when the real character of the disease was discovered by the local board. I was notified by telegraph, the patient was immediately isolated, and all persons (about forty in number) who had been exposed by visiting her were searched for, found, put under observation, and vaccinated. The disease was confined to two adjacent families. As the result there have been eight cases of small-pox and three deaths. November 16th, the remaining patients having recovered, and thorough disinfection completed, so far as that locality is concerned, the matter was closed. The Canadian authorities have been notified, and the minister of the Dominion government in charge of quarantine has informed me that the matter will receive careful consideration, with a view to prevent the recurrence of a case such as that described.[1] The story relates its own moral, and I do not know a better illustration of the intimate interdependence in the control of infectious disease between a country board of health in a north-western state of the United States, and the sanitary authorities of another government.

It shows, also, a defect in the quarantine system of the Dominion of Canada,—the lack of organization of that service under one responsible head. It is to be hoped that the government will avail itself of the first opportunity to remedy this defect, and so remove the inducement to evade or neglect the precautions which their admirable regulations, properly enforced, will surely secure. At present there are nine independent quarantine officers in its employ, having no official relation to each other, and reporting directly, and individually, to the minister. Under such conditions it is evident that any true coöperation between these officers in the common service of one government is impossible. The lack of such coördination on the Atlantic seaboard of the United States cannot be complained of by Canada, so long as the above statement is true.

This history proves very clearly, that the infectious diseases of men and domestic animals often effect their first lodgement in a state, in a remote

[1] See Appendix.

district, and unobserved. This is particularly true of cases which pass seaboard, or inland, observation and inspection *en route*, two methods of control to which so much attention has been given, as to neglect, if not to forget, this other vital point in our defence,—the oversight of immigrants at their destination, only possible by a system of notification from the seaboard sanitary authorities. The consequence has been, a feeling of false security, not justified by experience, but actually increasing danger, as the example I have given shows.

But a study of the vital statistics of any state where the country returns are reliable, is the best evidence of the need for rural sanitary organization and work. We find the same causes of sickness and death in operation there, but under different circumstances and with different results. The individuality of townships is often very clearly defined; due, largely, to local geology, topography, water-supply, nationality of population, house construction and use, and other causes. I wish I might go into the statistical and other evidence I have of this fact, but for present purpose will assume that the same rights, duties, and mutual obligations should be conceded to and required of the township board of health, in its place, as is conceded to or demanded of the city board in its field. One immediate result of this method is an intimate acquaintance, and prompt coöperation, between these country boards and the state board. It results in a living, instead of a mere formal, relationship, and covers all work required by law, besides enabling the state board, or more likely their executive officer, to know the condition and needs of each locality, and so to make any assistance or advice given, what is required, both in time and character. It involves the sanitary examination of water, foods, drinks, and special investigations on complaint, the management of epidemics, involving more than one sanitary district, and the protection of any given locality from sanitary dangers, both outside its territory and beyond its control. The last provision of itself, but still more with the rest, proves the need of state boards with executive and mandatory powers, if but for the consolidating of all the sanitary forces of the state for the common benefit of its entire population.

But a properly constituted state board of health has as important duties, for the protection of the people it serves, outside the state. The causes of ill-health, sickness, and premature death, and infectious diseases of men and domestic animals, are no more limited by state than by township lines; nor are the most important of the other sanitary problems so restricted, but relate to interests and dangers common to more than one state; so that if it were not an imperative duty, the union of our states, defensive and offensive, against the enemies of public health, would pay in a purely commercial sense, as a mutual benefit insurance company pays, in the legitimate returns of the business.

We have come, naturally and of necessity, to the question of the need for, and character of, the relations of state sanitary authorities to each other. The common field has widened as we advance, till now it includes all which those relations involve of duty, in reciprocity and

coöperation. It is apparent at the outset that the essential prerequisite to such mutual action must be, on the part of each state authority, one or more men especially qualified, by both education and experience in actual sanitary work of this character, who have the confidence of the people whom they serve, who have the legal authority and necessary funds, and who can, therefore, execute a contract agreed upon, in any direction found necessary, with decision and speed. It seems just as evident that a state representative for this professed purpose, who does not have these essential powers, can contribute nothing, where *action*, concerted and positive, is the object. The absence of these powers in so many of the state boards of health is the real reason for the feeble and halting attempts at actual and thorough interstate work, and explains their comparative failure.

Enough of the states now possess these essentials, to begin the attempt for the whole country on the basis here proposed. It is clearly the next step to take. The feeling will grow rapidly among working health officers, when the movement is fairly under way. Time will not permit me to elaborate this plan further; but I may be permitted to anticipate one objection which naturally occurs, though based on a misapprehension. It is that it would be difficult, if not impossible, and is certainly not desirable, to cast the organization of local or state boards into one mould. That goes almost without saying, and for reasons already stated. All that is asked is, that local boards shall be enabled to agree in methods of coöperation with the state board in each state, and that state boards have common powers in all that is required for efficient and thorough coöperation in every respect which will further their respective, or conjoined, interests in matters of public health.

But we cannot stop there. The logical sequence of our argument, and the "inexorable logic of events," compel another step. What share has the nation in the executive work of public health? This serious question demands a serious answer, and one which we are now ready, in many particulars, to give. The bars to a reply are not many, or difficult, and would be diminished both in number and importance, if we could agree, to begin with, upon just what a national organization should do to become the necessary complement of the properly organized state boards of health, for conjoined work within the national boundaries.

That the *ideal* national board of health should have control of the maritime sanitary work is doubtless true; but that the great Atlantic cities or states will surrender that right is, I fear, not doubtful. That the nation can assume that duty by legislation, is a very frequent assertion, but has not yet been done. This, and the national control of infectious diseases in and between states, has been attempted by indirection,—once, by restricting the national bounty of money to such states and localities as accepted the advice-rules of management prescribed by the national sanitary authority of the time. Another and more recent proposition, was legislation in the line of the interstate

commerce act, or to interpret that law as justifying national interference. I note that the Marine Hospital service, doubtless by advice, has made no attempt in these directions, but has confined itself to such aid and coöperation as the state authorities would accept.

The effort to compel coöperation on the lines referred to, by the threat of national legislation, or by perversion of existing law, or by half-way measures, is a very unstatesmanlike proceeding. Such attempts represent somebody's idea of what ought to be, rather than solve the question by meeting the necessary conditions imposed by already established facts and methods.

There are now in the United States thirty-one state boards of health. The first was organized in 1869, and others as well, before any attempt at national organization was made. Some of these boards are fully equipped with legal powers and funds for the work we have found laid out for them. The rest, with varying degrees of speed, are coming on to the higher level necessary for efficiency, and all are growing in usefulness and experience.

State boards of health are established and recognized forces to-day, and any national organization attempted must, to be successful, be a development from them in form and function, for the purpose of carrying over to the nation, as a whole, the sanitary succor which the best of the state boards afford to the populations they serve.

If those who are so strenuous in claiming the right of the nation to sea-coast quarantine would prove their faith by their works, and make up a case, in some way, for the supreme court, they would help to settle a vexatious problem. They had the best opportunity last year, in the condition of the quarantine of New York harbor, but no advantage was taken of it. There remains, therefore, now, in the minds of many of those who are dealing with the problem, serious and honest doubt as to this question, which bars any practical attempts in that direction. But something must be done, and we are driven to find another way of correlating national and state work in the sanitary control of our seaboard defences against the importation of diseases of men and animals. Much may be done in this direction by coöperation between existing authorities, state and national, if they only will.

It is of vastly more importance that we consider, first, what is the next step forward *within* our borders. I firmly believe it to be a thorough review of existing organizations for the purpose of bringing up those which are lacking in essential qualifications, for the work ahead, to the necessary degree of equipment and efficiency. Public health in this country, to-day, demands this help, not from congress, but from the state legislatures. It is, that the powers of the local boards, and of the state board, be made sufficient for the work each has to do in its own sphere, and for the work which they must do, as one body, for the whole population of the state, as we have already seen. This legislation, and organization, must *go before* successful national effort on the same lines. They will secure and fix the broad foundations upon which can be built

a national body, that, as our representative, shall perfect the national unity in all that is essential to victory against our common foes. The same is true of Canada. The bond of the compact must be that of the political union of states, "in essentials unity, in non-essentials liberty," so that the same principles and practice may find common expression in the laws and organization of the nation, as in the states. What other more practicable way is there to escape the venerable "union and progress, by resolution," which has been grand on paper, but useless for business?

Positive and concerted action, by authorities who can and will convert resolution that a thing ought to be done, into the doing of it, is what is now required if public health is to exchange "marking time" for real progress. Let us take this matter out of the old ruts of study and treatment, and set to work on the plan here outlined; let us make our organizations, of whatever degree, parts of a well ordered whole, so that the remotest, and feeblest, township board of health may know that it is in touch, sympathy, and coöperation with every other board, in every state, and with our brethren of the provinces of Canada, and so that the provincial and state boards may, in the same way, feel confidence in mutual effort and help. This great step securely taken, what can prevent national boards, there and here, adjusted to known needs, coöperating in interstate work, and exactly fitted to be our representative, in the settlement of international questions of public health, with similar organizations of other nations; or, if they cannot, or will not, coöperate in this necessary work, then to be in a position to advise our governments how best to protect our people without their aid?

In this view, a national board of health must first supply the national need proven to exist, by the conjoined efforts of the efficiently organized state boards, and fill up the full measure of that work within the national boundaries. So established, in the same dignified relation to the national government, that such state boards bear to the governments of the several states, it is prepared to perform the two-fold duty, beyond our borders, which results from our present knowledge of the modes of approach and attack of infectious diseases. It must protect the nation,—

First, by a thorough knowledge of the character, location, and movements of such diseases abroad.

Second, by preventing, by the best known methods, the shipping to this country of infected persons, animals, or things.

Third, by insisting upon competent sanitary service on board ship, with the best facilities for preventing, controlling, and crushing out any form of infection discovered on the passage out.

Fourth, by providing that the sanitary authority at the port of entry shall be fully informed of what is known of the sanitary history of the ship and her lading, up to the date of arrival, with later telegraphic report from the American consul and health officer at the port of departure, if necessary.

Commerce is peculiarly sensitive to restrictions upon travel, for any cause, but is learning that, in its own interest, it must coöperate in measures of this kind. Their self-evident necessity, and the deliberate movement to insist upon them by competent authority, will hasten the measures of coöperation by ship-owners, as it is already doing, notably on the St. Lawrence.

It is a fact that to-day, if it will, our government may learn all that is here proposed, by locating competent health officers at the foreign shipping ports, whence our greatest danger comes, and might keep the seaboard quarantine authorities fully posted in these important particulars. As to those local authorities, it is time to call a halt in the criticism of their work till all sides in the controversy can be heard; or, better still, till health officers of inland states can visit and see for themselves.

It was my good fortune to visit the provinces of Ontario and Quebec, this summer, and, by the courtesy of the provincial and local boards, to learn what I wished of their organization, relations, and efficiency. I called on the minister of the Dominion government in charge of quarantine, and was the guest of our associates, the officers of the Provincial Boards of Ontario and Quebec, and of Dr. Montizambert, the quarantine officer at Gross Isle on the St. Lawrence. The conclusions I reached are, that there is need of more intimate relations, and a better understanding, between the local and provincial boards, and between the last, particularly. Such understanding is all the more necessary, as they should advise as to changes in the quarantine system of the Dominion which I have already referred to. The minister impressed me as very anxious to perfect their work so well begun; and it is simple justice to say, that the plans of the executive officers, local, provincial, and quarantine, are far in advance of what they have been permitted to do. The inertia of old ways, in Quebec, is yielding to the steady and wise management of the provincial board, whose tact is as evident and helpful as their knowledge. The long experience of Dr. Montizambert in his present charge, united to a genuine pride in his work, has, despite many difficulties, enabled him to introduce great improvements in the service, and to plan for others, which, if accepted by his government, will put the quarantine system of Canada in the forefront, and, let us hope, compel our authorities to similar advance. Constant observation and honest criticism are just what sea-coast authorities need, and they have already done good. Inland state boards are too deeply concerned in their success to wish them anything less than full powers, equipment, and efficiency. That they have ever been compelled to doubt, and take unusual precautions, is a warning the seaboard authorities may take to heart, and use in claims for further improvement.

Commercial interests, by judicious guidance and experience, are becoming strong and reliable helpers in the control of epidemics. It is no disadvantage that they look upon it as a business measure. The great railroads find their interests to lie in the same direction, they listen

courteously to suggestions, and, in emergency,—to use a business phrase,—"stand ready to do even better." Behind all else come the growing popular appreciation and support.

We cannot wait for the best provision for national work. Here is a way for the national government to avoid an attempt to overrule state control of our sea-coast service, by a cordial coöperation, as suggested, with every seaboard authority, to make its quarantine effective. Let the national authorities rely on the inland state boards to maintain a close observation of the work, in self-defence. Let it serve the information, obtained as here suggested, on all the state boards alike, that all may be prepared to coöperate most efficiently, when needed. Such information given, and real efficiency guaranteed on the borders, the properly organized state boards can protect their own territory, and assist others less prepared in organization, legal authority, and funds. One good effect, of this clear definition of the actual powers of state boards, will surely be to induce legislatures of states, whose boards are thus crippled, to raise them to a footing with the best. In doing that, the claims of the local boards to similar attention cannot be denied in the common interest, thus making the forward movement general, and effective.

If I am right in these suggestions (of necessity but a sketch, and lacking many details impossible in an address like this), see how such widespread advance will stimulate healthy growth, in every form of sanitary service, all over the land. If wisely done, with due regard to the particular needs of the several states, how can it fail to put public health service into the most favorable position to contribute more than ever to the saving of life, the prevention of sickness and premature death,—in short, to the realizing, on the broadest field, our quest of to-night?

In the plan submitted to a meeting of state board officers in Nashville, in 1879, I did not venture what is proposed now, because the time had not come. The National Board of Health was on trial, and what we then needed was interstate coöperation as to notification of infectious disease. Now the circumstances are different. For reasons well understood, I avoid discussing the special organization of the National Health Service at this time, as that ought to come with the report of the committee on that subject.

Until the state boards agree in organization and powers, and in proper relations to local boards, the reorganization of the National Health Service upon a sufficient and permanent basis will be difficult, if not impossible. The sanitary service of the country, inside the national boundary, is now done by the state boards, whose organization is increasing in power and efficiency. What they and the local boards have done, under varied and great obstacles, speaks for itself, and demands no eulogy here. Nothing can stop that movement from becoming as popular, as it was in the beginning professional. It is but just begun. Compared with the victories of the future, those of the past will appear small, because the work ahead is proportionably greater.

Let us unite, then, more thoroughly than ever, in pushing on to our common end and aim, by making every sanitary organization, from the least to the greatest, the best possible, for the duty it has to perform. Then, sooner than we expect, out of our honest and faithful labors, and our disagreements, too (always inevitable in every real advance—I had almost said, essential to it), shall come the crown of our common work, a national organization coördinate in all essential details with the state boards, and their representative abroad. Standing in the same intimate and dignified relation with the government as did the old National Board, it will be the seal and the pledge of our union, disturbing no relations, rights, or duties of the state or local boards, but supplying another and essential help to the making the work of Public Health in America a still nearer approach to the ideal of what it ought to be, which is, for the earnest health officer, the ambition of his professional life, and the truest gauge of his progress.

APPENDIX.

The following correspondence will complete the record of the case of small-pox referred to in the address.

Having written immediately to the quarantine officer at Grosse Isle, he sent the following reply:

QUARANTINE STATION,
GROSSE ISLE, 22 Oct., 1888.

C. N. HEWITT, ESQ., M. D.,
Secretary State Board of Health of Minnesota.

DEAR DOCTOR: In reply to yours dated the 18th inst., I have to state that the S. S. "Parisian" is a mail steamer. As such she is visited by the inspecting officer at Rimouski, before being allowed to land her mail there, and only comes under my cognizance if, from sickness on board, on the inspection thereof, that officer withholds a clearance and sends her to this station. She did not report at the station on her inward voyage on August 24.

Yours truly,
(Signed) F. MONTIZAMBERT, M. D.,
Medical Superintendent.

Upon which the following letter was written to Mr. Lowe, Minister of Agriculture of the Dominion government:

STATE BOARD OF HEALTH OF MINNESOTA.
SECRETARY'S OFFICE.
RED WING, MINN., Nov. 7, 1888.

To The Honorable
The Minister of Agriculture,
Ottawa, Dominion of Canada.

SIR: When I had the honor of a conversation with you in August (with Dr. John Coventry, medical health officer of Windsor), I did not think that an illustration of the subject we were discussing would so soon occur. But the correspondence which Dr. Montizambert, your quarantine officer at Grosse Isle, has submitted to you, shows that what we thought *might* happen was at the very time happening. A woman infected with small-

pox passed inspection at Rimouski, landed at Quebec on August 24, came to a remote township in Minnesota, sickened about September 2, exposed about forty other people before the disease was recognized, and to date there have been seven (7) cases and three (3) deaths, including the woman herself, among the sick. I venture to hope that your officers will be able to get the *locality*, *character*, and *date* of the infection of this case, bearing so directly on the question of the precautions which should be taken before permitting persons or things to enter ships for this side, without a clear history of freedom from the infection of a disease whose incubation is long enough to enable the victim to get to the remotest inhabited locality in Canada or the United States before the disease declare itself. It is rare that so clear an illustration occurs of the necessity for more stringent regulations at *foreign ports*, to protect the populations of this side the Atlantic. The possibility that such importation may be, as in this case, into districts not on the lookout, or prepared for the attack, is a very serious feature of the danger, because infection may spread widely from such an outbreak before its very existence is discovered.

I should have sent the correspondence directly to you, but I had forgotten for the moment that your quarantine system is not a unit, under one head—a quarantine officer, responsible to the minister for the unity and efficiency of the whole service—and wrote to Dr. Montizambert under the impression that all immigrant inspection on the St. Lawrence was done by him.

May the importance of the matter be a sufficient excuse for my venturing to trouble you, and may I express the hope that this investigation and a renewed study of the best methods of preventing or controlling epidemic disease at the sea-coast may result in giving to Canada the best system on the continent.

With sincere respect,
I beg to remain
Yours respectfully,
(Signed) CHARLES N. HEWITT, M. D.,
Secretary State Board of Health of Minnesota,
and President American Public Health Association.

To which he replied,—

OTTAWA, 10 Nov., 1888.

SIR: I have to acknowledge your letter of the 7th instant, on the subject of the St. Lawrence quarantine regulations, and, in reply, to inform you that the representations in your letter will receive careful consideration, with a view to prevent the recurrence of a case such as that which you describe.

I have the honor to be,
Sir,
Your obedient servant,
(Signed) J. LOWE,
Deputy Minister of Agriculture.

CHARLES N. HEWITT, ESQ., M. D.,
Secretary of the State Board of Health,
and President of the American Public Health Association.
RED WING,
Minn.

And, again:

OTTAWA, 5 Nov., 1888.

SIR: Adverting to the correspondence with you on the subject of a case of small-pox, alleged to have been conveyed to Minnesota in the person of a woman said to have arrived by the "Parisian," during the month of August last, I think it well further to say, that a correspondence was entered into by this department with the Allan Line on this subject.

The name of the woman, as given to the department by Dr. Montizambert, the medical superintendent at Grosse Isle, was Jette Mathiasdatter, but, respecting this, Messrs.

H. and A. Allan wrote to say that they had no such name on their list of passengers by the "Parisian" during the month of August last. This matter was referred to Dr. Montizambert, who made an explanation in a letter (a copy of which I enclose herewith), which was communicated to the Messrs. Allan. They again replied that they were still unable, by the information furnished, to trace the passenger upon the name given. It is, therefore, in the circumstances, requested that you will furnish to the department such information as would prove that the woman in question came by the "Parisian."

I have the honour to be,
Sir,
Your obedient servant,
(Signed) J. LOWE,
Deputy Minister of Agriculture.

C. N. HEWITT, ESQ., M. D.,
Secretary State Board of Health,
RED WING, Minn.

To which the following reply and inclosure were sent:

Dec. 15, 1888.

HON. J. LOWE,
Minister of Agriculture,
Ottawa,
Canada.

DEAR SIR: I beg leave to submit, at the earliest possible moment, herewith enclosed, a copy of a letter from the agents of the Allan Line, who sold the ticket to the woman in question, and to whom she reported on arriving in this country. I trust that this will be the means of absolute identification, as it settles the fact of her arrival on the "Parisian," August 24, and gives her number. The company has no more excuse for delay in accounting for the exposure.

Yours respectfully,
(Signed) CHARLES N. HEWITT, M. D.,
Secretary State Board of Health.

[ENCLOSURE.]

SCANDIA BANK OF MINNEAPOLIS.
MINNEAPOLIS, Dec. 14, 1888.

CHAS. N. HEWITT, ESQ., M. D.,
Secretary State Board of Health,
Red Wing, Minn.

DEAR SIR: Referring to the enclosed, received in your favor of the 12th inst.: The full name of the passenger referred to is Jette Mathiasdatter Sylstad, and number of her ocean ticket issued here was 27,611; arrived Quebec, in "Parisian," August 24, 1888. Trusting that the above is satisfactory, I am

Yours truly,
(Signed) A. C. HANYAN,
Cashier.

II.

ADDRESS OF WELCOME.

BY HON. JOHN JOHNSTON, OF MILWAUKEE, WIS.

MR. CHAIRMAN, LADIES, AND GENTLEMEN:—I am one of those unfortunate individuals who cannot speak unless they have time to prepare, and you have heard how much notice I have had—about two minutes. So many thoughts and ideas crowd in upon me that I hardly know how to express them.

You will believe me when I say the citizens of Milwaukee welcome this convention to their midst. This is an era of conventions. Last week I attended a convention of the National Board of Trade; a month ago I should have been in Cincinnati at a National Bankers' Convention; a few weeks ago the civil engineers had a national convention in this city. It is an age of national conventions, and it is well to come together and compare notes, and get all the knowledge we possibly can from each other.

It is wonderful what progress is being made in all the departments of science, literature, engineering—everything. It is only a few years since the only means of navigation was by the winds, or by the muscles of men. The old Roman galleys were propelled by benches of rowers; but in that way it would take 250,000 men to propel one of our grand ocean steamers, such as the City of New York or the Etruria.

We are making similar progress in the business world. If there is any deficiency in any of the markets of the world, the telegraphs will make that deficiency known all over the world, and just as soon as steam can bring the supply, the deficiency will be made up from the uttermost parts of the earth. So the words of the ancient prophet are fulfilled: "Say unto the East, give up, and unto the West, keep not back; bring my sons from afar and my daughters from the ends of the earth."

It seems as if we were in a most wonderful age of advancement in every line; and I am sure those who attend to our health, the health of our bodies, are not behind those who attend to science, commerce, and trade. I attended a few months ago a meeting of our labor men. Occasionally you will find one who thinks nobody is of any use except he labor with his hands. I took occasion to say that if a carpenter is supposed to be a great producer when he mends the leg of a wheelbarrow, how much more of a producer is he who mends the leg of the carpenter! We have those here to-night who do not attempt to run steam engines, or manufacture telescopes, but those who attend to keep-

ing in repair the human system, the human eye and ear, and all the wonderful mechanism of the human body; for we are fearfully and wonderfully made. We have these men with us who take care of the health of our bodies; and there cannot be an altogether healthy mind unless the body be in health.

If I have any fault to find with the doctors, it is because they sometimes keep in existence longer than they ought unhealthy people to propagate the species. I think it would be better to let some kinds of people slip out of the would when they ought to do so. However, I am getting away from my text.

I beg leave to assure you that the citizens of Milwaukee are delighted to have this convention in their midst, and hope to learn much from what they hear. I am sure if this meeting had been properly advertised there would have been more here than could have been accommodated. It was a mere accident that I heard of it, and I looked "The Wisconsin" over and found no notice of it, but I fortunately met a gentleman who did know of it. I hope by the time you get fairly going you will have an opportunity to become convinced how thoroughly welcome you are to this beautiful city of the lakes. I am sure that at the reception to-morrow evening at the Athenæum you will find such a gathering of the men and women of Milwaukee as will convince you that our people are in full sympathy with your great and beneficent work, and that we bid you a most hearty welcome.

III.

REMARKS ON THE CLASSIFICATION OF DISEASES.

By HENRY B. BAKER, M. D.
Lansing, Mich.

Mr. President and Members of the Association:—This paper has been prepared in response to an invitation of our president, given, perhaps, because I was for some years a compiler of vital statistics, but more likely because, like himself and others of this Association, I have had to use, nearly every day for several years, the results of some one's compilation of vital statistics.

I suppose an important question is, What methods of compiling vital statistics are found most useful to those who are making the greatest or most frequent use of such statistics in practical sanitary work?

In this paper, however, there is no attempt to go over so much ground as that question implies. The paper is limited to the classification of diseases, and an effort has been made to so condense what I have to suggest, that it may serve to start vigorous thought, and perhaps lead to a useful comparison of views by those who are practical workers in this field.

Fifteen or twenty years ago, one of the most imposing ideas connected with the study of vital statistics was the "statistical nosology." The classification of diseases was supposed to be of great importance, and every one who compiled vital statistics in those days devoted considerable time and labor to the work of distributing all deaths reported in groups, in accordance with some system of classification, usually that of Dr. William Farr, which is well known, and may here be briefly summarized. He made five classes, as follows: I, Zymotic diseases; II, Constitutional diseases; III, Local diseases; IV, Developmental diseases; V, Violent deaths. These were subdivided into orders, and in each order were the several species. Now this all looks like science: it has the air of such classifications as are familiar to us in botany and in zoölogy. We may also grant that the system has been useful, inasmuch as a theory of causation is implied by the terms zymotic and constitutional, and this has led many to criticise and to study subjects connected with the causation of the diseases included in these classes—many who otherwise would not have given the subject of causation a thought. The system has been employed for purposes of comparing the healthfulness of localities, and it has been useful because it has sometimes been found that measures supposed to be especially effective for reducing the mortality from zymotic diseases, have been found to reduce the mortality from a

disease in another class. Thus Dr. Buchanan, in 1865, 1866, and 1867, found that measures such as improved drainage, etc., not only appeared to have reduced the mortality of those diseases which they were supposed to influence, but that the mortality from consumption was also reduced thereby.[1]

The time has passed when the physician or the scientific investigator can be an expert in every branch of ætiology. This is an age of division of labor, and the ever widening field of scientific discovery renders more and more special the work of any one investigator. Yet one may combine the expert work done by many others, and he who studies to generalize in the science of the causation of disease must embrace the work of the physiologist, the pathologist, the bacteriologist, the chemist, the meteorologist, and many others whose work was formally supposed to lie entirely outside of this domain. This division of labor has tended to divert the attention from the study of the classification of diseases to a more thorough study of particular diseases, very much as the increasing perfection of the microscope and of our knowledge of microscopical anatomy has broadened our ideas, and opened to view a field so vast that gross anatomy, although it still supplies such an important basis for the art of surgery, seems only a primary lesson at the beginning of some of our medical sciences. So in ætiology, microscopical anatomy counts for much more than does gross anatomy; and, similarly, the statistical facts of age, sex, locality, etc., and of all the meteorological and other conditions which may have relation to disease, need to be studied with special reference to each particular disease. While classifications are to be desired, a classification which shall be "an exhibition of the system or order in nature," if such a classification can ever be made, must necessarily depend on a correct knowledge of the causation of the diseases composing the different classes; and until these diseases are all more thoroughly studied and their causes better understood, any classification must necessarily be artificial, incomplete, and subject to change. Inasmuch as the main purposes of mortality statistics are for use in studying the causation of diseases, this may be almost equivalent to saying that any classification of diseases in vital statistics is of small consequence. Yet classification is the orderly and systematic arrangement of facts, without which science cannot make progress; and this applies to diseases as well as to animals and plants.

But to a great extent, at least in this generation, every investigator must use his own classification. For example: Small-pox, diphtheria, and scarlet fever are classed among the zymotic diseases. Yet, as I have elsewhere pointed out, these diseases are controlled in their rise and fall by the fall and rise of the atmospheric temperature. This leads, naturally, to a classification of these diseases with pneumonia, bronchitis, tonsilitis, influenza, and those other diseases of the lungs and air-passages which I have classified as "cold weather diseases," designating that subgroup which includes the contagious diseases as "cold weather com-

[1] Tenth Report of the Medical Officer of the Privy Council, with Appendix, 1867. London, Eng.

municable diseases." To the bacteriologist some of these diseases are principally of interest as being caused by a specific micro-organism; to the meteorologist they are principally of interest from the fact that they are most likely to be communicated when the atmosphere is cold and dry; and the ætiologist, using the work of the physiologist and the pathologist, thinks he knows the reason why,—because then the air-passages are most susceptible to the lodgment of the specific cause. Whether the most importance shall be assigned to the specific germ of the disease, or to the cold, dry atmosphere which largely controls the conditions of its development, need not be discussed here; but the bacteriologist and the meteorologist will still continue their investigations in their own field, and artificial classifications will be helpful if they are properly used. Thus new systems of classification should continually appear, each new system overlapping preceding systems, but not necessarily displacing them.

SUMMARY.

1. For statistical purposes, the least misleading and the most generally useful classification of diseases is their alphabetical arrangement; and this each compiler should give.

2. The difficulties in the way of usefully comparing countries, or states or localities in this country, by means of any system of classification of diseases, are so great that each compiler should ponder the question whether it is worth while to take the trouble and expense of any classification other than the alphabetical, except the compiler himself is to use in the same volume the results of the classification for purposes of further comparisons and studies.

3. Several systems of classifications have their uses, and we may even look forward to a time when mankind may be able to know the natural classes of diseases; but, for the present, it is of vastly more consequence that each particular disease shall be studied so thoroughly that we may learn all the conditions of its existence;—therefore compilers of vital statistics should give us, relative to each separate disease, as many classes of facts likely to have causal relations as it is possible to give.

4. If, after a compiler has fully complied with the above, he has yet power to do more, he may classify the diseases according to any system which he thinks will prove most useful to those who will use the statistics he compiles. I prefer the system of Dr. Farr, but I make most use of a classification into "cold-weather diseases" and "warm-weather diseases," and sub-divide these, giving the "cold-weather communicable diseases" and the "warm-weather communicable diseases," including as species, yellow fever, cholera, etc.

5. Any system of classification should be held only tentatively. In so far as any system yet proposed tends to teach that the whole truth is expressed or implied therein, it is misleading, and it may be a hindrance except it excite criticism, and thus lead to investigation, and thus to the truth.

IV.

SANITATION IN ST. PAUL.

By HENRY F. HOYT, M.D., Commissioner of Health.

Truly it may be said of St. Paul that it is a city founded upon a rock. It is situated upon both sides of the Mississippi river, about eight miles below the Falls of St. Anthony, gradually spreading back on either side for a number of miles upon a series of plateaus and bluffs, commencing at the water's edge, and ascending in some instances by easy stages, and in others quite precipitately, to an elevation of 230 feet above the level of the river, thus creating a natural drainage toward the same. The formation is largely lime and sand-rock, covered with loam, clay, and sand subsoil. The exceptions to this are several swampy tracts, gravel-beds, and other mixed deposits.

The population in 1850 was 1,294; in 1887 it was 150,000. We have no record of the death-rate in 1850, but in 1887 it was 12.78 per one thousand inhabitants. In 1880 the health department consisted of a health officer with one or two assistants. I am proud to state, however, that during the past eight years many people in our new, busy, rapidly developing, phenomenally growing city have taken time enough during their breathing spells, in the rapid race for wealth and position, to become thoroughly conversant with sanitary science, to recognize the important part that it occupies in the growth and prosperity of a city; and we now have, with few exceptions, their cordial, earnest, and substantial assistance whenever it becomes needful.

The department of 1888 is as follows: Health commissioner, assistant health commissioner, officer in charge of contagious diseases, ten inspectors, two meat and one live-stock inspector, one officer in charge of dump-dock, and one in charge of small-pox hospital. The men all wear uniform and star, each one having charge of a district bringing in reports and receiving orders twice a day. Our redress, when orders and regulations can be enforced in no other way, is the municipal court, where offenders are fined from $10 to $100, according to the offence.

WATER- AND ICE-SUPPLY.

Our water-supply is derived from a system of fresh water spring lakes, commencing near the city limits on the north side and extending in that direction for a distance of twenty-five miles. The lower portion of the city is supplied by a gravity service, and the portions lying on our hills and bluffs by what we call high service, the water in this district being forced up by a pump having a capacity of five million gallons daily.

Our present entire system could supply, if necessary, thirty million gallons daily, and we have lakes tributary to these that could be tapped in dry seasons, or other emergencies, and more than double the present quantity. An analysis of the water taken from the lakes where it enters the conduit, in 1880, by our worthy president, Dr. Hewitt, shows,—Total solids, 8.1 grs.; destructible matter, 3.7 grs.; ammonia, .008 of a gr.; albuminoid ammonia, .01 of a gr.; chlorine, .2 of a gr. per one U. S. gallon. One good indication of its purity is the variety and quality of the fish found in it,—croppies, black, and rock bass. Pike and pickerel abound in these lakes: they are never found in a fine, healthy condition, except in the purest and best quality of water.

The entire system—conduits, mains, and all tributary piping—is thoroughly flushed three times yearly, and also locally wherever necessary.

Space forbids a more extended description of our water-supply, of which we are justly proud; so I have limited my remarks to the few facts that most interest the sanitarian,—source, quantity, and quality.

Before concluding the water question, however, there is one point of interest that we have in connection with our public water department that I am informed is not duplicated in any city of the world. I have stated before that a certain portion of our city was built upon strata of lime and sand-rock. The lime is above, with an average depth of fifteen to twenty feet. Under this stratum of lime-rock, down in the sand-stone at an average depth of twenty feet below the surface, the water board have pierced the rock with tunnels $3\frac{1}{2}$ feet wide by 6 feet high, along which the water mains are laid. There is now about three miles of this tunnel, and it will be extended as rapidly as required.

Formerly our supply of ice was almost entirely derived from the river, while all knew perfectly well that the river was but the sewer for our sister city, Minneapolis, eight miles above us, and that our own refuse and sewers went into the same receptacle; yet the old idea, that freezing purified the water, blinded them to the real dangers of the river ice. In 1884 I had charge of the department, and personally obtained specimens of ice from where they always had cut, and were then cutting, in the river—from Lakes Minnetonka, Como, and Phalen, all near St. Paul and Minneapolis, and had them analyzed by Prof. Weitbrecht, the professor of chemistry at the high school, and the comparative results were so manifestly in favor of the lake ice, that river ice was at once boycotted and has never been used since.

MEAT INSPECTION.

Four years ago it was learned that among the many thousands of cattle that are shipped yearly from Montana and the West, via St. Paul, the crippled and diseased were culled from the healthy while here, killed, and our people supplied with the meat for food. This knowledge resulted in a rigid system of inspection of meats, both before and after slaughtering. Anything that is not fit for food is condemned, injected with petroleum, and turned over to the rendering companies.

STREETS AND SEWERS.

I shall only speak of those streets that are paved, of which we have about twenty-five miles. The varieties of paving are cedar block, granite, pine block, and asphalt. These streets are, during the spring, summer, and autumn, swept once in twenty-four hours, part by day and part by night, some by hand and some by the two-horse revolving broom. The sweepings are utilized in filling up low places in the vicinity of our levees.

Of sewers we have eighty miles. They have an average fall of two feet to the hundred, and empty into the Mississippi. According to the building inspector's report, we have now about 60,000 inhabited houses in St. Paul, of which only 4,500 are connected with sewers, and 7,200 are supplied with city water. I refer to this to show what a Herculean task is before us in the matter of enforcing sewer and water alone. Reports have been accurately kept for a number of years of the sanitary surroundings of premises where diphtheria and scarlet-fever have occurred, and the per cent. of cases in houses that have sewer and water connections tells a story of its own. Out of two hundred and ninety-one houses where diphtheria appeared, only forty-one were connected with sewer and city water. The remaining two hundred and fifty were supplied with wells, spring, and cistern water, cesspool or surface drainage.

THE GATHERING OF GARBAGE, MANURE, AND NIGHT-SOIL, AND THE DISPOSITION OF THE SAME.

This material is gathered by a company who have an exclusive franchise for doing the work. They are allowed to charge and collect from each person who requires their services, according to the amount, etc., of actual service rendered. Prices are regulated by the common council. The company are required to get separate permits from the department for such premises as require their service, and return within a certain time a report of the work done, which is placed on file; and in that way an accurate record of all such work is kept, and the people protected from dishonest measurements and over-charges. Garbage is required to be collected and moved in covered receptacles. In the gathering of night-soil many experiments have been made, with various pumps, vacuum tanks, etc., but with very few exceptions they are all useless. The most satisfactory apparatus is what is now being used—the "barrel system." It is perfected to such a degree that during the past summer it was in operation during the entire day-time without being a nuisance. A tent made for that purpose is placed over the vault: strong disinfectants are used. The material is put into clean casks, which, when filled, are headed up with a contrivance that makes them perfectly air-tight, and they can then be loaded, hauled, and shipped with the same facility as a barrel of beef. By actual record, 98 per cent. of vaults cleaned, 75 per cent. of garbage, 50 per cent. of back yards cleaned, manure and dead animals removed, are compulsory. Last year the contents of about 2,500

vaults, 66,877 loads of garbage and manure, and 783 dead animals were removed. So it is easily demonstrated that the health department is not idle.

When I speak of the disposition of this material, I realize that I am upon a vast subject, and one, perhaps, that has occupied the mind of the sanitarian as much as any other branch of the science, if not more; and yet it seems to be a long way from a settlement yet, *i. e.*, practically. We, I think, can all reason satisfactorily to ourselves just how these things should be disposed of to the best interests of the human race; but when we attempt to put our ideas or theories into practical operation the trouble begins. There is much I would like to say upon this subject, but brief as I have tried to be, my paper will still be rather long, so I will continue to confine myself to facts. We have many times made strong efforts to regulate this question as it should be; but so far our efforts have met with but very little success. That great bugbear of all sanitarians, expense, continually stares us in the face. The public will spend large sums of money for parks, boulevards, shade-trees, street illuminations, street processions, banquets, etc., etc., which are all right in their way; but when we ask for the ways and means of rendering harmless and useful the tons upon tons of dangerous material that is now sown broadcast to contaminate air and water, to propagate its crop of billions of disease germs, and to reap its harvest of death, we invariably meet with the same answer, "It costs too much,"—as if it were a matter of dollars and cents. Right here I may state that this one subject is the only one that occurs to me now in which we have not been fully sustained by the authorities and the public. The public press, I am proud to say, have strongly advocated our ideas in this respect, as they have also in many other of our measures that denote progress.

In summer, garbage, manure, and night-soil are now carried to a dock on the edge of the Mississippi river, in the heart of the city, and there loaded upon barges which are towed down the river below the city limits and there emptied into the river. In winter it is dumped through a hole in the ice. Further comment is useless.

We St. Paulites are just now very much interested in an experiment which is being tried in our sister city, Minneapolis: I refer to a crematory for garbage, etc., that has recently been constructed and operated there by their very efficient and energetic health officer, Dr. S. S. Kilvington. If he succeeds—and I sincerely hope that he will—a precedent will have been established in our section of the country, and we may hope for better things in that line.

CONTAGIOUS DISEASES.

Physicians are required by law to report at once to the department of health any case or cases of the following diseases that may come under their observation,—small-pox, diphtheria, scarlet-fever, and membranous croup. They are furnished postal cards for this purpose by the depart-

ment, and I am pleased to record that a neglect of this ordinance is very rare. An officer is at once sent to the case, the house placarded, printed orders and directions given regarding isolation, disinfection, etc.; children, if any, that are attending school are quarantined at home, and notices are at once sent to their school, so that they cannot attend again until they have a clean bill of health from the department.

When the case or cases are ready to be discharged, the department is notified of that fact by the attending physician on cards which are furnished for that purpose, and the premises are at once disinfected under the personal surveillance of one of our officers, and the quarantine is then raised.

In case of death, the funeral is private and the remains always carried in a hearse. This system of quarantine and private funerals was not inaugurated and put in operation as smoothly and easily as it can be read from this paper. We labored under many difficulties at first, often requiring the assistance of the courts, and not a few times the officers were in danger of being mobbed; but a continued perseverance of what we knew to be right has won in the end, and a decided opposition to our methods is now rare. The above refers to diphtheria, scarlet-fever, and membranous croup. Small-pox, when possible, we remove to the hospital, which we have for that purpose outside of the city limits. When this is not practicable, we establish a rigid quarantine, wherever it may be, enforced by officers day and night, vaccinate everybody in the vicinity, and so far we have had very little trouble in stamping out several threatened epidemics, one of which I will briefly relate.

The little daughter of a man keeping a cheap boarding-house in the heart of our city was taken sick. Her parents called in a so called "magnetic healer," who treated the child. In a few days an eruption broke out all over the child, which the "healer" reassuringly informed the parents was the "humor" in the blood, which was being driven out by her treatment. The child becoming rapidly worse, the family lost confidence in the magnet, called in a physician, and, to their horror and dismay, he at once informed them that their little one was dying with malignant small-pox. She died that night. Upon investigation we discovered that a man had remained in the house as a boarder several days, who had come direct from a lumber camp in the woods where small-pox was then prevalent. The child had never been vaccinated, and no doubt contracted the disease from him. From this case, where so many had been exposed, ten cases resulted. By a rigid quarantine and vigilant watching for "suspects," there was but this one crop of cases, every one of which was distinctly traced to the child.

CHOLERA INFANTUM.

I regret to state that the largest mortality that we have from any one disease is from that scourge of the innocents, cholera infantum, a disease that I am afraid some of us have neglected in our strenuous endeavors to eradicate diphtheria, scarlet-fever, etc.

Last spring I caused a circular to be addressed to each of the two hundred physicians in our city, requesting them to send me their opinions upon the care of infants, and the cause and possible prevention of cholera infantum. Their replies I condensed, and embodied them, together with a few hints from the department, in a printed circular in several languages, one of which was sent to the home of each child whose birth had been reported to the department during the year previous, and several thousands beside were distributed by the officers while on their regular beats. The circular is as follows:

RULES FOR THE CARE OF INFANTS.

DEPARTMENT OF HEALTH,
ST. PAUL, MINN., July, 1888.

The following rules are the opinions of the physicians of St. Paul in a condensed and simple form, gratuitously given, for the management of children during the hot season, with a view to prevent, or greatly lessen, the mortality of this class:

I.

NURSING OF INFANTS.

Overfeeding does great harm. Nurse infant a month or two old every two or three hours. Infant of six months and over, not more than five times in twenty-four hours.

If infant gets thirsty between nursing hours, give it a little pure water, or barley water, no sugar. If water is from a well or cistern, boil, and cool it before giving.

On the hottest days a few drops of whiskey may be added to either water or food, the whiskey not to exceed a teaspoonful in twenty-four hours.

II.

FEEDING OF INFANTS.

The best substitute for mothers' milk is fresh sweet cows' milk. It should be diluted with enough boiling water to make it lukewarm; add a small amount of either milk sugar or white sugar, a pinch of salt, and it is ready.

The amount to be given an infant one or two months old is four ounces, and it should be prepared fresh every time. Any left in the bottle should be thrown away.

When cows' milk does not agree with the child, use condensed milk, prepared with the same care as cows' milk. Boil a teaspoonful of powdered barley (ground in a coffee-grinder) in one half pint water, with a little salt, for fifteen minutes; strain, then mix it with half as much boiled milk; add a lump of white sugar, size of a walnut, and give it lukewarm from nursing-bottle.

For infants five or six months old, give half barley-water and half boiled milk, with salt and lump of sugar.

For older infants give more milk than barley-water.

When infants are very costive, use oatmeal instead of barley.

When your breast milk is not sufficient, change off between it and some variety of this prepared food.

Infants should be fed from a simple bottle and rubber nipple, which should always be thoroughly cleansed, after each using, with hot water containing a little soda, and when not in use should be kept in cold water.

In hot weather if blue litmus paper applied to the food turns red, the food is too acid, and a fresh mess must be made, or a pinch of baking soda added.

Infants of six months may have beef tea or beef soup once a day, by itself or mixed with other food, and when ten or twelve months old a crust of bread and a piece of rare beef to suck.

Give no candies—in fact, nothing that is not contained in these rules, without a doctor's orders.

III.

CHOLERA INFANTUM.

Caused by improper over-feeding and hot, foul air. Never neglect looseness of the bowels in an infant, but consult your physician at once. Keep your doors and windows open, and ventilate house from top to bottom every day. Wash your well children with cool water twice a day, at least, during the hot season. Lime or copperas should be freely used in vaults, cesspools, or damp cellars twice a week during hot weather. Any accumulation of garbage, manure, refuse, or any decomposing material that may be on your premises, either above or below ground, should be removed at once. Provide some receptacle for kitchen garbage—a barrel with cover is suitable and economical—removing the contents at least once a week, and oftener, if necessary, and keep barrel disinfected with lime. Particularly avoid throwing slops of any kind, garbage, or other deleterious substances, into the yard, streets, alleys, or over the fence on to your neighbor's premises. Clean up your own homes and keep them clean, and if your neighbor is negligent report it to the Health Office, City Hall.

The above is approved, issued, and distributed by the Department of Health.

HENRY F. HOYT, M.D.,
Commissioner of Health.

A. P. HENDRICKSON,
Assistant Commissioner of Health.

While we did not expect to accomplish *much* in one year, yet we went on the principle that every little helps. The deaths from cholera infantum for the past five years, including this, are as follows: 1884, 99; 1885, 104—an increase of 5; 1886, 150—an increase of 46; 1887, 170—an increase of 20; 1888, 167. A decrease of three from last year would not be great, providing our population was the same; but when we take into consideration the increase, it means considerable, and we are perhaps justified in thinking that the influence of the little circular is perceptible. Whether the origin of cholera infantum is in bad air, filth, or imperfect drainage, over, under, or improper feeding, artificial or natural food, and many other alleged causes, I will hardly venture an opinion before this learned assembly; but I sincerely hope that during this meeting I may glean knowledge from the congregated wisdom that has honored me with an audience, which will enable me, with the small means at my command, to prolong the lives of many poor, helpless infants, that in my humble opinion are now unnecessarily lost.

V.

PROPOSED PLAN FOR THE DISPOSITION OF NIGHT-SOIL, GARBAGE, &c., AT ST. PAUL, MINN.

By HENRY F. HOYT, M.D., Commissioner of Health.

I do not expect to present anything new, novel, or strikingly original in this paper, for the subject has been studied, written up, thoroughly discussed in every conceivable manner and from every standpoint, for years and years, by able, wise, learned, and scientific men. Yet with all the knowledge, light, and information that we have at present, I regret to be compelled to report that in our city, up to date, this material is disposed of by simply dumping it into the Mississippi river. I have endeavored to incorporate two principles in my plan that in my mind are very essential when one undertakes to have a thing of this kind adopted by the public, *i. e.*, practicability and economy. I shall propose to have erected, in a suitable locality, which in our city happens to be upon an island in the river, a plant which will cost from $5,000 up, according to its capacity, and which I will describe in brief as follows: An engine, a tank or series of tanks, and a powerful press. The tanks will be cylindrical in shape, and arranged so as to receive night-soil and garbage. Running through the centre will be a revolving shaft, protruding from which will be a series of strong blades.

The material will be put into the tank together with a proper quantity of some cheap disinfectant, the tank closed, the revolving shaft started, thus thoroughly mixing the contents, and hot steam forced through the mass to a degree that will effectually destroy all germs, disease, or otherwise. Gases which will be generated will be conducted through a small pipe to the fire-box, and there be consumed. The semi-liquid contents of the tank after being thus treated will pass into the press, the liquid portions pressed out into the sewer, and the solids used for fertilizing purposes.

Should material be received in some cases in too dry condition, it can be diluted while being placed in the tank. Horse manure will be put in the press only, and the dehydrated material used for fuel in the fire-box, thus cutting down one of the chief items of expense. The advantages of this system are as follows: 1st. It takes care of the most objectionable compound that we have to dispose of, *i. e.*, night-soil; 2d. It does not destroy everything as cremation does, but creates a most valuable supply of fertilizing material; 3d. It can be operated for about one half that it would cost to cremate; 4th. By the double disinfection of heat and chemicals, the process is as complete a germicide as cremation.

VI.

PROBLEMS IN REGARD TO YELLOW-FEVER AND THE PREVENTION OF YELLOW-FEVER EPIDEMICS.

BY JEROME COCHRAN, M. D.,

STATE HEALTH OFFICER OF ALABAMA.

In the practical application of sanitary science, the question of questions in all our Southern communities is that which concerns the management of yellow-fever and the prevention of yellow-fever epidemics. The natural habitat of this disease is in the West India Islands, which are in constant communication with our gulf and Atlantic ports; and these again are in constant communication with all the cities and towns of our Southern states. The railroads, with locomotives running from twenty to forty miles an hour, have virtually abolished distances, and brought the whole interior of the country down to the shores of the sea.

Up to the present time yellow-fever has never gained a permanent footing in any part of the United States—has never become naturalized amongst us; but we are now confronted with the danger that it may by possibility find an abiding domicile in the more southerly portions of Florida,—that is to say, in that part of the state of Florida below the frost line. Last winter it hibernated as far north as Tampa and Plant City, but last winter was exceedingly mild in Florida, and furnishes the first instance of hibernation that has occurred in the epidemic history of the state. In Jacksonville the winters are always cold enough to eradicate yellow-fever. If we have, this coming winter, an average amount of frost and cold in Florida, I am of the opinion that there is not likely to be any hibernation of the disease in any of the places where it has prevailed this summer, unless it may be in the small towns on the Manatee river; and even in these small towns the chances are even that it will die out for want of material. In a large majority of epidemics that have visited Key West, where frost was never known to show itself, the fever has disappeared in the month of August; and it has never been known to hiberninate there.

Yellow-fever is certainly infectious, and the specific poison that causes it—a poison as specific as atropia or hydrocyanic acid—can be transported from place to place in the ordinary vehicles of travel and traffic, in the bodies and baggage of men and women. This specific poison is undoubtedly connected in some way with the presence of some living organism, some bacterium, some microbe, some living disease-germ of some sort, and probably belongs to the class of chemical substances known as ptomaines. As yet neither the poisonous ptomaine, nor the

living organism which generates it, has been demonstrated; and so there are many unsolved problems connected with the etiology of the disease. A few of these I will briefly indicate:

(1) Does the pathogenic organism multiply its generations within the human body, or outside of it? or does it find conditions favorable to its growth and multiplication, both in the body of the patient and in the patient's environment? Its multiplication within the body of the patient has been denied, but I think not with sufficient reason. If the organism is not itself active within the body of the sick person, I known of no clue to the explanation of some of the facts connected with the propagation of epidemics. In the meantime its growth in the environment seems hardly to admit of question. Upon no other hypothesis can we explain the infection of localities.

(2) How does the specific cause of the disease find its way into the body of the patient? Is it absorbed through the skin? Hardly, I should think. Does it find its way through the pulmonary vesicles in the act of respiration? I know of no facts which favor this presumption. On the contrary, both the pulmonary vesicles and the expired air are singularly free from the presence of germs of any sort. Only one other avenue is left open for its introduction—the alimentary mucous membrane. In support of this doctrine, also, the paucity of facts is remarkable. In all the literature on the subject, so far as it is known to me, nothing is recorded to connect its introduction with the alimentary ingesta,—with any sort of food or drink. Can it be that the germs first find lodgement, in the act of respiration, in the mucous membrane of the mouth and pharynx, to be subsequently swallowed along with what we eat and drink? It must get into the system in some of these ways, and it seems to me that the probabilities are most favorable to the one last mentioned. But in regard to this, let it be remembered that for the present all is pure speculation—mere guess-work, and nothing more.

(3) If the germ is generated within the body, how does it find its way out so as to become an agent for the infection of communities and localities? Is it thrown off with the exhalations of the skin? with the sweat? Or is it thrown off with the expired air in the act of breathing? Or is it eliminated through the kidneys? Or does it make its exit through the great sewer of the intestines in company with the alvine excretions? We have absolutely no facts to enable us to answer these questions, but it would seem to be the more probable supposition that it escapes from the body with the dejections from the alimentary canal; and, if this is the case, Parke was right years ago when he called yellow-fever a fecal disease.

(4) In the production of the clinical phenomena of yellow-fever, the poison permeates the entire system of the patient. It causes marked nervous disturbance. It leads to fatty degeneration of the liver and other organs and tissues. It attacks the blood corpuscles so as to cause them to part with their coloring materials. It develops acute desquamative nephritis, with albuminuria and urinary suppression, and the whole

train of symptoms characteristic of what we ordinarily call uræmic poisoning. All these pathological phenomena may be ascribed, with great plausibility, to the action of the hypothetical ptomaine, which would readily find its way into the circulating blood, and so to all the tissues and organs of the body.

(5) Of the germ itself, as already stated, we know nothing in any positive and direct fashion. It has never been demonstrated. No man has ever seen it with his eyes, or touched it with his fingers. The *cryptococcus zantho genicus* of Friere, and the *peronospora lutea* of Carmona, are not real existences; and the germs of Finley and Gibier have not been shown to have anything to do in the production of yellow-fever. It may be accepted as tolerably certain that in yellow-fever no distinctive organisms are to be found in the blood or in the tissues. This seems to me to have been settled once for all by Sternberg's Havana researches in 1879. At any rate, all those at present engaged in this research have, by common consent, turned their attention to the flora of the alimentary canal. Theoretically, a microbe in the alimentary canal, generating a poisonous ptomaine, to be subsequently absorbed into the circulation, would account for all the phenomena of the disease.

Fortunately it is not necessary that all these problems of ultimate pathology should be solved in order that we may frame some rational scheme for the prevention of the spread of yellow-fever. A few of the leading facts, derived from observation of the habits of the disease, and attending its dissemination in time and space, I proceed to mention very briefly:

(1) Yellow-fever, as already stated, is infectious, and is propagated by the introduction into the human system of a specific poison, or of a specific organism which generates a specific poison, and which is transportable from place to place. In an immense majority of recorded epidemics the outbreak of the disease is in traceable connection with the introduction into the stricken community of some person from a place already infected, who has the fever at the time of his coming or within a few days thereafter. In a much smaller number of instances it is traceable to the introduction of baggage, clothing, or bedding, brought from some infected place, and which has been used about some one who had the fever. Other agents and vehicles of infection are so infrequently the causes of epidemics as not to require any special mention here.

(2) While the disease spreads from the patient, it is not, perhaps, at all, and certainly not to any considerable extent, contagious from person to person, like small-pox. In its transmission it is probably somewhat analogous to typhoid fever and cholera. It seems to take root in the locality—in the soil, as it were—and to be contracted from the environment of the patient rather than from the patient himself; and the locality remains infected after the patient has been removed—remains infected for weeks, and even months.

(3) But yellow-fever does not always spread on the introduction of an exotic case. On the contrary, it is the rule, in the large majority of

instances, that one or two cases occurring in a community may fail to establish an epidemic. A thousand sparks may fall on the roof of a house, but perhaps only one of them kindles into flame and causes a conflagration. Doctors and nurses are frequently exposed for a long time before they take the fever; and very often they pass through an epidemic, and even through several epidemics, without contracting the fever. The great factor in the dissemination of the fever is human intercourse. It is known that scarlet fever and diphtheria can be carried from place to place by cats and dogs, and I know of no reason why the poison of yellow-fever cannot be carried in the same way. Yellow-fever is not disseminated ordinarily to any large extent by atmospheric currents. Ordinarily, it will not cross a street unless somebody carries it across. Ordinarily, it will not surmount a wall twenty feet high. It is usually not very dangerous to walk the streets of an infected city in the daytime. The danger is greater at night.

(4) The golden rule of prophylaxis in yellow fever is, non-intercourse—non-intercourse with infected places, non-intercourse with infected persons, and non-intercourse with infected things. If you keep away from the fire, you won't get burned, and it is not necessary to keep very far away either. The instances are very numerous in which prisons, jails, and cloistered convents, in the very midst of epidemics, have escaped infection. The instances are also numerous in which, in the midst of epidemics, private residences have in like manner, by the observance of strict isolation, escaped infection. These facts are of the utmost importance, and should be generally known and generally acted upon when yellow-fever is on its travels.

(5) It seems reasonable to believe that in infected places all persons who are at all exposed must receive into their bodies some portion, larger or smaller, of the poisonous ptomaine which generates the disease, or some number, more or less, of the specific germs which generate the ptomaine. But all who are so exposed do not take the fever. In other words, the question of dose seems to be, in this case, as in other cases, a consideration not to be overlooked. Some of those exposed suffer no ill consequences whatever. Others suffer more or less malaise for longer or shorter times, but escape any decided attack of the fever. Others have the fever in mild form, and readily recover. Others, still, have it in every grade of increasing severity up to those malignant explosions that cause death in a few hours. It seems to me fair to conclude that these varying results are due to the interaction of two factors—differences in the quantity of the poison received, and differences in the power of resistance to the influence of the poison possessed by the several classes of persons mentioned.

(6) As to differences of susceptibility, there can be no question about that. Whites are far more susceptible than blacks. Men are more susceptible than women. Adults are more susceptible than children. Besides these broad distinctions, there are others not so manifest, but I think equally certain. Amongst the whites, those with dark hair and skin and

with what is sometimes called the bilious temperament are less susceptible than those with light hair and fair skin and the sanguine temperament; and the same individual is more susceptible at some times than at other times.

(7) For the purposes of the sanitarian, the length of the period of incubation is a consideration of importance, as upon this depends the rational period of detention of persons in quarantine. Our information in regard to this question is not so precise as we could wish it to be. It is commonly assumed that the solution of this question depends on the ascertained facts in cases where yellow-fever occurs after a single exposure. In such cases as these, so far as I have been able to find out, the period of incubation is frequently only one or two days, and is rarely more than five days. Refugees who have yellow-fever at all usually have it within five days after leaving the infected locality; but I am not at all sure that the same rule always obtains in the infected locality. Here doubtless the poison is passing into the system from day to day, and at the same time passing out of the system from day to day. If the elimination of the poison keeps pace with the introduction of it, the man does not have yellow-fever at all; but if the process of elimination is defective, the poison accumulates until at last the resistance is overcome, and the febrile explosion follows.

(8) I cannot dwell on the question of diagnosis, although it is practically one of the utmost importance. If the case is severe, with yellow discoloration, suppression of urine, black vomit, and death, no physician of reasonable knowledge ought to have any difficulty in saying that it is yellow-fever. But suppose the case is a mild one, without discoloration, without suppression, without black vomit, and without a fatal termination: how is the diagnosis to be made then? Even in such cases the expert finds but little difficulty. He recognizes his old acquaintance under all sorts of disguises. There is the three days of the initial fever, continued or *quasi* continued. There is the want of parallelism between the pulse and the temperature, which is usually observable to some extent even in mild cases; but the most certain diagnostic in this class of cases is the presence, to some extent, of albumin in the urine on the third or fourth day, usually on the third.

But all the problems so far suggested are preliminary to the great practical question of the prevention of the spread of yellow-fever, which may be discussed under three different heads: (1) To prevent the introduction amongst us of yellow-fever across the sea from foreign countries. (2) To prevent the transmission of yellow-fever from one part of our own country to another by land. (3) To prevent the spread of yellow-fever in our towns and cities after the outbreak of a few cases.

(1) The methods of maritime quarantine in this country may now be considered as definitely settled. They include the inspection of ships at the port of departure and at the port of arrival, with such detention and disinfection as may seem advisable. The larger number of our seaport quarantines are little more than inspection stations. These are supple-

mented by a sufficient number of thoroughly equipped refuge stations to which infected vessels are sent for treatment, said inspection stations being under the management of the marine hospital service. I take some special interest in these refuge stations because they grew out of a recommendation made by me to the National Board of Health in 1879. In the meantime a few of our large cities have well equipped disinfecting stations of their own, that at New Orleans being probably the most complete and the most efficient in its appointments. I think it may be fairly admitted that our maritime quarantine affords us a considerable degree of protection; and, fortunately, an immense majority of the vessels that come to us from infected ports are themselves free from infection. I should say that nineteen out of twenty of all vessels from infected ports are free from infection, and might be allowed *pratique* without any preliminary detention or disinfection. However this may be, and in spite of all possible quarantine diligence, yellow fever will sometimes find a lodgement in some of our seaport cities. There is contraband of revenue, and there must be contraband of quarantine. The appearance of yellow-fever in one of our seaports is the signal and the warrant for the imposition of quarantine by land.

(2) The difficulties attending the administration of sea quarantine are many and great; but they are few and small indeed when compared with the difficulties attending the administration of quarantine by land. Land quarantine virtually resolves itself into the quarantine of the railroads; but the railroads are so numerous, they link together the towns and cities of the country in such an intricate network of connecting and intersecting lines of travel, and the travel over them is so rapid and continuous, flowing always, day and night, in never ceasing currents and counter-currents, that any adequate supervision of them becomes a matter of great perplexity and magnitude. The principle that underlies the practice of railroad quarantine amongst us is, that neither persons nor things shall be allowed to leave the infected place. To this end the railroad trains, both passenger trains and freight trains, are prohibited from stopping in or near the infected town, so that nothing can be taken on that is tainted with suspicion; and inspectors are kept on the trains so that nothing from the stricken community can be put off where it is not wanted—neither goods nor persons. This system of railroad quarantine is fundamentally correct, but in the administration of it the most outrageous excesses have been committed. The expenditures have been often so heavy as to be very burthensome to the corporations that have had to foot the bills; and commerce and travel have been interfered with to an extent not warranted by the imminence of the danger. The remedy for these evils is not far to seek. The several states concerned must place the administration of their quarantine laws in the hands of yellow-fever experts, and must give to such yellow-fever experts the power to overrule and supplement the work of non-expert municipal authorities. I have merely glanced at the subject of railroad quarantine, and must hasten on to the principal subject of my paper.

(3) What I want specially to consider is the management of yellow-fever in our towns and cities after the occurrence of a single case, or of a few cases, so as to prevent its dissemination generally through the community; and in my judgment this sort of work depends on principles I now proceed to formulate. I confine myself to towns and cities, because in sparsely settled country neighborhoods yellow-fever shows very little disposition to spread. It is urban and not rural.

(4) The extent and populousness of the town is an important consideration. The problem is difficult in proportion to the number of inhabitants, and in proportion as residences and business houses are crowded together. In a small, sparsely settled railroad town, where the houses are scattered about at considerable distances one from another, the problem is simple. In a densely populated city it is a problem of great complexity and difficulty.

(5) The golden rule of prophylaxis in yellow-fever is isolation,—non-intercourse,—non-intercourse with infected places, non-intercourse with infected persons, and non-intercourse with infected things. Do n't go near the fire and you won't get burned. Non-intercourse can be enforced in a very simple, very inexpensive, and very effective way. Let the people, with one accord, by common consent, in the exercise of the commonest sort of common-sense, keep away from the infected houses and localities, and refuse to have anything to do with infected persons or infected things. To do this so as to secure absolute safety, it would be necessary for the members of every family to shut themselves up in their own premises, and to enforce a strict domiciliary quarantine against all the rest of the world. But a reasonable degree of safety can be had without resorting to quite such extreme measures.

(6) At the beginning of an outbreak the infection is restricted within very narrow limits,—a single house, a block of houses, a single city square; and then it is necessary only to avoid the infected place or places, and to keep at a respectful distance the persons and things that have been exposed to the infection. Intercourse with other parts of the town is still perfectly safe. And, indeed, at this time a certain amount of intercourse with the infected region is also comparatively safe. You may go into the infected region many times and not take the fever. You may even nurse the sick for a long time without taking the fever. But while all this is true, no communication with the infected region should be allowed beyond what is strictly necessary. The pitcher that goes often to the well is apt to be broken in the course of time.

(7) In small places it would hardly ever be necessary to put guards around an infected house or an infected district. A simple warning to the people should be sufficient. In more populous communities guards may sometimes be desirable.

(8) But the sick must be taken care of,—must have nurses and doctors. What must be done with these? The doctor who spends but a little time with his patient is not likely to carry the infection with him

into other houses he may have occasion to enter. Still, by possibility he may become a carrier of the infection, and his intercourse with other people should be restrained according to circumstances. The nurse has no need to leave the premises of the patient, and should be kept under the strictest surveillance. When the area of infection begins to extend and cases to multiply, arrangements should be made for the isolation of nurses and of all other persons engaged in taking care of the sick. Take a house within the infected region, or near by, or as many houses as may be needed, for this purpose. I cannot dilate on this; only let it never be forgotten that the most active agents for the spread of yellow-fever in any community are nurses and doctors and other attendants upon the sick, when they are allowed to eat and sleep in their own uninfected homes or boarding-houses; and in dealing with these attendants upon the sick, let it never be forgotten that amongst all the agencies that have been invoked to prevent the spread of yellow-fever, non-intercourse is the first in importance—is so decidedly first in importance that all the others sink almost into insignificance.

(9) The practice of disinfection is mostly based on hypothetical grounds. But I think we have good reason to believe that it does good. The agents most to be trusted are heat, cold, the mercury bi-chloride, and sulphur fumigation. It is not proven that the yellow fever poison is connected in any way with the excretions of the yellow fever patient; but I think the alvine dejections and the urine should be disinfected and disposed of just as we would the excretions of typhoid fever.

(10) The probability that a few cases of yellow-fever will spread into an epidemic depends very much on the latitude of the place and the season of the year. It is very generally believed by those who have studied yellow-fever, that it requires for its prevalence and dissemination a long continued temperature of not less than seventy degrees Fah. It takes some time for yellow-fever to gain a footing anywhere and under any circumstances. It cannot make any considerable headway in less than two weeks, and often it requires a much greater length of time. Yellow-fever in July or August is much more to be dreaded than yellow-fever in September or October; and quarantines may be still useful a hundred miles south of an infected town long after there ceases to be any excuse for it a hundred miles north of said town.

(11) When a few cases of yellow-fever occur in a city, the general opinion is that depopulation is the surest way to prevent it from expanding into epidemic dimensions. Take away the fuel, and the fire will soon cease to burn. This plan is plausible at first sight, and I do not question its efficacy. But it is attended with so many incidental disadvantages that it seems to me to be the most objectionable plan for general adoption that has ever been devised. It is not very difficult, indeed, to depopulate the infected district so long as it is restricted within narrow limits; and I believe that depopulation of an infected district may often be the highest dictate of sanitary wisdom. It would be quite possible, also, to depopulate a small town of only a few hundred inhabitants, or perhaps

even a city of a few thousand inhabitants. But it would be folly to attempt to depopulate a great city like New York or New Orleans. But there is never any urgent need for the depopulation of small and sparsely settled villages. In them yellow-fever can be managed easily by other methods. And precisely in proportion as the population increases in numbers and density, just in that same proportion increase the danger of the epidemic and the consequent desirability of depopulation, if that is to be accepted as the proper plan of management. In other words, the more we need the remedy, the greater becomes the difficulty of using it.

(12) With us depopulation, so far as it is accomplished at all, is accomplished only in one way, namely, by the wild and reckless stampede of a demoralized and panic-stricken people. Almost all who are able to go do so, and a great many who are not able. The impecunious are left behind to the mercy of the pestilence and the charity of the compassionate. In the meantime the depopulation is never complete. From one third to one half of the people are obliged to stay at home, because they are not able to pay the expenses involved in getting away and living somewhere else. And this is not the worst. These flying people spread panic wherever they go, the panic being far more infectious than the fever; and then follows an epidemic of quarantines. The big towns quarantine because they have so much at stake; and the little towns quarantine because they think they have as much right to be protected as their big neighbors. And such quarantines!—unlawful, extravagant, absurd, grotesque, foolish, cruel,—in one word, abominable beyond all that words have power to give expression to. If the history of them could be written, it would fill up a goodly portion of that history of human folly which Prof. Porson proposed to write in five hundred volumes.

(13) Another agency in the management of epidemics needs to be mentioned here—the agency of refugee camps. *A priori* one would think they would serve a good purpose, but practically they have always been failures, and they must continue to be failures. In the first place, it is next to impossible to get a place for the establishment of a refugee camp. People do n't want refugee camps anywhere in the neighborhood of their residences, and won't have them. In the second place, when you succeed in establishing a camp, it accomplishes comparatively little because you cannot drive the people of the infected town into it; and I do n't blame them for their reluctance. If you had the power of a Russian czar, by force of arms you might drive the people into the camp, but in no other way.

(14) I have thus endeavored, in a very brief and imperfect fashion, to indicate what we know of the natural history of yellow fever, and of the conditions which mark its propagation in time and space. I have, also, in the same brief and imperfect fashion, indicated some of the evil consequences of our present methods of managing yellow fever epidemics. I need not go further back than the history of this present year to point the moral I have in mind. We have seen the people of the entire South

wild with panic, flying recklessly from their homes, and scattering consternation and dismay all over the country. I suppose there is no other single consideration that stands so much in the way of Southern development as this spectre of yellow-fever which is always associated with our sunny climate in the minds of the people who desire to settle amongst us. How is all this to be changed? There is but one way. We must educate our people, our doctors, and even our health officials, to a better appreciation of the true character of the enemy we have to battle with. Let it be understood that yellow-fever is not contagious from person to person as small-pox is; that in a majority of instances, when introduced into our communities, it fails to spread at all; that when it does spread, it spreads at first very slowly, so that the threatened people always have plenty of time to await the progress of events; that if it becomes desirable for the people to leave their homes, there will always be opportunities for them to do so in a systematic and orderly way. In a word, we must manage our yellow-fever epidemics in a common-sense, business way. We must get rid of our panics, our stampedes, and our shot-gun quarantines. The guardians of the public health owe it to themselves and to the people they serve to effect such a change in public opinion as will make it possible in the future to avoid the follies which have convulsed and disgraced the country in connection with our yellow-fever epidemics during the last fifteen or twenty years.

VII.

THE OUTBREAK OF YELLOW-FEVER AT JACKSON, MISSISSIPPI, IN SEPTEMBER, 1888.

By WIRT JOHNSTON, M. D., Secr'y Miss. State Board of Health.

The outbreak of yellow-fever at Jackson, Miss., in September, 1888, presents some features that may be of interest to sanitarians, and is another illustration of the previously well known fact to those acquainted with the history of the disease, but it would seem one not so well understood by the public, that yellow-fever may occur sporadically without resulting in an epidemic.

The history of the outbreak, with the measures instituted for its suppression, will be briefly related.

On September 20, at about the same hour, two of the local physicians, Drs. Harrington and Morgan, informed me that they had patients sick with a suspicious fever, and that they had regarded them with suspicion for two or three days. The former declared his belief that his patient had yellow-fever, and the suspicions of the latter were so strong as to amount almost to a conviction that his two patients also had the disease. It was at once arranged for me to visit the patients. Before doing so, however, being strongly impressed with the idea that the cases were yellow-fever on account of my confidence in the ability of the gentlemen reporting them, and fully appreciating the great responsibility involved in a final decision as to the character of the disease, I telegraphed two well known physicians of Vicksburg, and invited them to come on the evening train to see the cases with the local physicians. Then, in company with Drs. Harrington and Galloway, I visited Mr. Calhoun, the patient of the former, and found he had been sick about four days. In company with Drs. Morgan, Galloway, and Harrington, I then visited the two patients of Dr. Morgan, Mr. Lorance and Mr. Lee, and found that both had been sick about five days. After the examination of the cases, a consultation was held by the physicians named, and it was agreed to pronounce the cases as suspicious, and await the arrival of the physicians from Vicksburg before positively deciding the character of the disease. At the conclusion of this consultation, at about 3 o'clock P. M., the cases were officially announced to our citizens as suspicious, and so telegraphed to the boards of health of the Gulf States in accordance with an existing agreement. Upon the arrival of Dr. Iglehart, president of the Vicksburg Board of Health, and Dr. Purnell, of the hospital of that city, at 6 o'clock P. M., the following local physicians, in company with them, visited the cases, viz., Drs. Harrington, Morgan, Galloway, Todd,

health officer of the county, Hunter, a member of the state board of health, and myself. At the consultation held, all of these gentlemen agreed that the disease was yellow-fever, and it was at once officially reported as such. Under the laws of the state, the state board of health assumed control of the sanitary management of the town. The first object in the way of prevention was depopulation, and this had already commenced upon the first announcement of the fever, and was being rapidly accomplished without much assistance from us. Many of the citizens sought refuge in the surrounding country, and arrangements were made with the officials of the Illinois Central Railroad to run special trains to convey the people to Northern points. Arrangements were made as speedily as possible for the establishment of a refuge-camp for the safety of those who had not been able to leave the town. This camp was not, however, used to any great extent, on account of the fortunate termination of the fever.

It is safe to say that within thirty-six hours about 5,000 persons had taken their departure, leaving behind the following population, as shown by a census taken at the time: Whites, 398; colored, 1,593;—total, 1,991. Whites protected by an attack of the disease, 126; colored protected, 299;—total protected, 425.

The town, while not having a population of more than 7,000, covers a considerable area, and the residences for the most part have large grounds and are widely separated. The exodus of citizens almost depopulated the infected district, and created long distances between inhabited dwellings.

Guards were stationed at the infected houses, with instructions to permit no one to have access except physicians and nurses; and an effort was made to keep under observation every one who had been exposed to the disease. The houses were designated by yellow flags.

As soon as the depopulation of the town had been accomplished so far as practicable, a night and day force of guards were stationed on all avenues of escape, with instructions to permit no one to pass either in or out without written permission.

Three of the four railroads entering the town were compelled to stop running their trains on account of the quarantine restrictions of the places along their lines. Only one road, the Illinois Central, continued to run its trains, and on this road, a mile and a half north of the town, we established a quarantine-station, where trains stopped under the supervision of a quarantine officer, and freight and express matter was discharged, which was subseqently brought into the town by a locomotive and car located there. No person was permitted to get on board or off the cars at this station, and no freight or other article from the town was permitted to be taken on board. All cars on side-tracks were detained. No mails left the town, not that we thought they would be dangerous after fumigation, but because other localities refused to receive them.

As soon as practicable, disinfection was resorted to, as follows: Infected bedding was burned, linen and cotton fabrics were boiled in a 1

to 500 bi-chloride of mercury solution, the floors and walls of infected houses were scrubbed with the bi-chloride solution, and the rooms with their contents were subjected to sulphurous fumigation.

There were in all 13 cases and 5 deaths (14 cases were reported, but it was subsequently discovered that a mistake had been made in the diagnosis of one case). During their sickness these cases were located at eleven points, some of them being as far as a mile apart. All of the persons attacked by the disease were employed about the Illlnois Central Railroad depot, as follows: John Lorance, a policeman, whose beat was about the depot, taken sick September 15; J. B. Lee, the contractor who was building the new depot, taken sick September 15; J. A. Calhoun, check-clerk, taken sick September 16; Adam Shuler, laborer, taken sick September 16; Joe Bourne, yard-master, taken sick September 17; Lewis Livingston, plasterer, working on new depot, taken sick September 18; David Hipple, painter, working on new depot, taken sick September 18; Chas. Daley, tinner, working on new depot, taken sick September 19; Meredith Watts, night watchman, taken sick September 19; Frank Kavanaugh, painter, working on new depot, taken sick September 19; Joe McCoy, freight handler, taken sick September 19; John Harris, freight handler, taken sick September 15; Mrs. Lee, wife of Mr. Lee, the contractor, who resided near the depot and boarded the hands working under her husband, taken sick September 20.

The fact of all the cases having been employed about this depot, strongly points to this locality as the focus of infection, and the fact that all the cases were developed so near together would also lead to the conclusion that they were exposed to the infection about the same time. In close proximity to the freight depot of the Illinois Central Railroad, there was being erected a new passenger depot which was nearly completed; and in this locality not only the freight and passenger trains of the above named road stop, but also the passenger trains of the Vicksburg & Meridian Railroad, a road running east and west, and having extensive connections in the states east of Jackson. These trains haul a sleeping-car from Atlanta, Ga. I am of the opinion that the infection was brought over one or the other of these roads by either some person, baggage, or freight: just what has not yet been ascertained, and it may never be. Through the kindness of the officials of the Illinois Central Railroad, I have been permitted to investigate the books of their freight office, but failed to discover that any car or freight was brought from an infected place.

Something has been said of local causes, such as excavations, having produced the disease; but, in my opinion, this is not to be seriously considered,—for, in the first place, I do not believe that the disease originates *de novo* in this country; and in the next place, there was nothing unsanitary that I could discover about the locality. There had been a foundation dug for the new depot building, but I am informed that this was done in the latter part of May and the first of June, and the fever occurred in the middle of September. It is true, some very superficial

grading had recently been done in the locality in changing the railroad tracks and switches.

The last cases of the fever were reported to me on September 22, but were really taken sick on the 16th, 18th, 19th, and 20th insts. It was not deemed prudent to remove the quarantine restrictions around the town and admit the absent citizen until October 12, after a house to house inspection had been made of the infected district. From statements made to me recently, it would seem that several cases of the fever occurred which were not reported, as they did not call a physician during their sickness, and were first discovered during convalescence.

Now as to the clinical history of the fever, I will state that the attacks commenced with a distinct chill, followed by a fever of one paroxysm, the duration of which was from three to four days, accompanied with supra-orbital headache, pain in the back and limbs, flushed face, and injected conjunctivæ, spongy gums, and epigastric tenderness. There was want of the correlation of pulse-rate and temperature, generally observed in other fevers. On the third or fourth day, the conjunctivæ and skin presented an icterode hue, and in most of the cases assumed a decided yellow color. The cases were hemorrhagic, bleeding from the nose, gums, lips, and one quite freely from slight abrasions of the skin. The urine of all was albuminous, some specimens being loaded with albumen. All of the fatal cases died of suppression of urine and consequent uraemic toxaemia. The convalescence of those who recovered was tedious and protracted.

It is to be regretted that an autopsy was not performed: this was not done on account of my entire time being occupied with the sanitary affairs of the town. The cases, however, were so well marked that it was really not necessary in order to verify the diagnosis of the disease.

It is unfortunate that a record of the temperature of the weather was not kept; but it was lower than usual at the season of the year, one or two light frosts being reported early in October, the first, I believe, on the 3d, which no doubt contributed greatly to prevent the spread of the disease.

VIII.

SOME OBSERVATIONS ON YELLOW-FEVER AND ITS HABITUDES, AS OPPOSED TO THE FALLACIES AND DANGERS OF PERSONAL QUARANTINE.

By A. N. Bell, A. M., M. D.
Brooklyn, N. Y.

Extemporized "shot-gun" quarantines, such as those maintained against yellow-fever in 1878, and recently revived in several of the Southern states during the prevalence of the recent epidemic in Florida, are the logical outcome of widespread erroneous notions with regard to the true nature of yellow-fever and the means by which it is propagated. Such quarantines are fraught with the utmost danger to the people who would fly from infected places, greatly add to the public alarm, and tend to divert attention from the conditions most likely to give lodgement to it and to other diseases, consequently are more likely to promote the propagation of the disease than to prevent it.

The recent propositions in congress to vote $100,000 to any one who would procure a copyright remedy for yellow-fever; to convene certain distinguished naturalists and astronomers, such as one whom ignorance of the nature of the disease helped to kill; to test the method of cure by spirits of ammonia; and to discover a certain doctor in New Hampshire who knows more about the disease than anybody else,—are equivalent forces to the great guns fired to allay the fever in Jacksonville, and to the shot-gun quarantines with their sentinels on the fever nests of other vulnerable communities. A tithe of the energy displayed by such follies and inhuman efforts to confine people to infected places, employed in keeping their own homes and surroundings in good sanitary condition, would not only have been a much more reliable means of preventing the spread of the disease, but would have enabled most of them to follow the noble example of Hendersonville in offering hospitality to all refugees.

Indeed, the episode of Hendersonville, a cleanly little city located in the mountains of North Carolina, twenty-three hundred feet above the level of the sea, affords a pointed illustration of the non-contagiousness of the disease and of the immunity of such places from infection, and is, moreover, an admirable example of the intelligence, trustworthiness, and wholesoulness of a people ever ready to practise the courage of their convictions. Conscious alike of the conditions which insured their own safety, and of the only condition which could insure safety to the people of an infected place, they stood not upon the order of the proceedings, but threw their doors wide open, and invited all who would to come in.

But so many eagerly availed themselves of the invitation that for a time there seemed to be danger of overcrowding, and of continuance of the fever among the fugitives from that cause.

The facts of the case, as officially reported by Dr. John Guiteras to the surgeon-general of the United States Marine Hospital Service, are as follows:

The train left Jacksonville on the morning of September 11, and was joined by myself and the Camp Perry contingent at Folkston, Ga., making in all a total of two hundred and ninety-one souls.

Unfortunately the trip was prolonged beyond the time anticipated, on account of several accidents on the road. These, perhaps, might have been provided for with greater promptitude by the railroad authorities had they fully recognized the gravity of the situation. The evils resulting from this delay were twofold. First, the running short of rations. This was provided for to a great extent,—sometimes by the generosity, and at others by the cupidity, of the towns along the road. Some parties at Atlanta and Macon generously furnished relishes, while others charged exorbitant prices. I must mention, however, the most conspicuous example of generosity. This was shown by the town of Easley, S. C., which provided, without any charges, and late in the night, the most abundant assortment of supplies.

The second and most important consequence of delay was the development of cases of yellow-fever on the train. Only two cases developed in the first twenty-four hours, and three in the course of the second day. Of course it was to be expected that this would happen in an aggregation of people leaving Jacksonville; but it is very probable that the accumulation of people, clothes, and baggage for so long a time in hot cars, which could not be kept in a sanitary condition, created a secondary centre of infection that would show itself in the development of cases after the arrival in Hendersonville.

The appearance of yellow-fever among the refugees had a very unfavorable effect upon the *morale* of the party. They were truly panic-stricken. One car quarantined strictly against the other, and efforts to escape were frequently made, and, unfortunately, in a few instances with success.

One lady was taken with labor pains in the train, and, with the consent of a local physician, she was allowed to remain at White Sulphur Springs, near Gainsville, Ga.

A marked contrast was apparent between the two cars occupied by the refugees from Camp Perry and the rest of the train. Among the former no cases of yellow-fever occurred, and the *morale* was excellent. These two cars were strictly quarantined against the rest. No complaint was heard, no fear expressed. In the other cars the spectacle was pitiful. The isolation of the sick in one car, I discovered, would have increased the excitement by bringing together and crowding still more people from the different cars, who were suspicious of each other.

Great credit is due to that portion of the refugees who gave me their support throughout the journey. It was owing to their kind firmness that we had no decided breach of discipline.

We arrived at Hendersonville on the 13th, at 2 o'clock A. M. The hospitality of that generous people became at once apparent. They had been up all night, preparing a building for the reception of the sick. Fires were built around the station, adding warmth and cheerfulness to the cordiality of the reception. With the assistance of Dr. Few, of Hendersonville, the patients were removed to the hospital. The refugees found accommodation at very reasonable rates.

On the morning of the arrival, a sixth case of yellow-fever developed. The comparatively large proportion of cases has caused much excitement, and it is probable that some of the refugees will break their parole.

—*Weekly Abstract of Sanitary Reports*, *No.* 38, *September* 21, 1888.

A correspondent of the New Orleans *Times-Democrat*, under date of September 20, writes,—

The train, on arrival, was met by a committee and twenty-five carriages, and in forty-five minutes every refugee was quartered in the best hotels and boarding-houses in the town. There were five cases of the fever on the train, and five more developed that day; and those are the only cases that have developed, even among the refugees.

There have been two deaths, six discharged from the hospital, and two are progressing favorably. There is not a tent in the town. . . . It has been reported that, on account of the panic, Hendersonville is depopulated. As a matter of fact, no resident has left, and only a few summer visitors.

That notwithstanding the aggravating circumstances of the transit only ten cases should have occurred among the refugees, and not a single case in the community, though the refugees were given the freedom of the city, is a lesson, surely, which should impress itself upon other communities now, and ever hereafter, as the happy result of a sensible and generous hospitality.

It seems hardly reasonable to believe that only ten of the whole number of persons who were transferred from Jacksonville and thereabouts were infected at the time they left. The inference is that the infection in some cases was eliminated by the change in circumstances.

The result of this change is in thorough keeping with the writer's own observations under similar circumstances on several occasions, and with the history of yellow-fever generally; that it is non-contagious from person to person independent of *fomites*, uncommunicable to places, except under favoring conditions of climate and locality, and the *poison* (without regard to its essential nature) eliminatable before culmination by the *vis medicatrix naturæ*, under timely change to healthful surroundings: and this it is our purpose to show by what follows.

A little more than forty-one years ago the writer was, for the first time, brought in contact with yellow-fever, and at the outset, for several weeks consecutively, occupied a ward with from four to eight patients affected with the disease, with beds sufficiently near to be within reach on either side. This was in a hospital built of unplaned pine boards on Salmadina island, near Vera Cruz. An adjoining ward—and the only one additional—of the same hospital, during the time, was occupied by from twenty to forty patients affected with the same disease. The writer was in excellent health during the time of his service there, as also were the other attendants and nurses who had not before been exposed to infected ships or places, not one of whom contracted the disease in that place. And such was the record of the hospital, also, with regard to those who preceded and followed him. But the time came when the writer was transferred from the hospital to an infected ship—the steam frigate Mississippi. On the third day thereafter he was taken with the disease, and on the following day was, with many other cases, transferred to the Naval Hospital, at Pensacola, Florida.

During his convalescence, the following incident was related to him by the surgeon in charge, the late Dr. Isaac Hulse, United States Navy: In 1838, the French frigate Gomer put in at Pensacola in distress, and sent about four hundred cases of yellow-fever to the hospital, which was also at that time in Dr. Hulse's charge. One of the surgeons and a number

of the crew of the frigate, who had thus far escaped the fever, were transferred with the sick to assist in their care. But this service was new to the men so detailed, and shortly there was a panic among them. To convince them that their fears were groundless, the surgeon of the Gomer wrapped himself at ten o'clock at night in the bedclothes of a person who had died of the black vomit, immediately after the removal of the dead body, turned in, and occupied the same bed throughout the night: this act put an end to the panic. The surgeon did not contract the fever, nor did any one of the nurses. Moreover, Dr. Hulse added, there had never been an instance under his observation, in that hospital or elsewhere, where the fever was communicated by one person to another. And here it may be remarked, that Dr. Hulse, who served upward of twenty years in that hospital, when yellow-fever prevailed much more extensively in the naval ships of the Gulf than it has in recent years, and the said hospital was the common resort, had extraordinary opportunities for acquiring an intimate knowledge of the disease.

After the writer's recovery, two months subsequent to his having been sent to the Pensacola Naval Hospital, he returned to service in the vicinity of Vera Cruz by the same ship, which had, meanwhile, been "broken out" and limed. But it was soon found that she had not been disinfected, that new cases continued to occur on board in proportion to new subjects who were so unfortunate as to be ordered to her, until she was sent North, and subjected to thorough cleansing.

During the following eight months and subsequent cruising and communication with other ports in the same region along the Spanish Main, followed by cruising in the West Indies and on the west coast of Africa—comprising a period of five years—the writer made use of his opportunities to familiarize himself with the conditions of yellow fever in all of its aspects.

In every place where he has observed the disease, or examined the localities and conditions where it is wont to prevail, it is more or less circumscribed by deposits of vegetable matter in process of putrefaction, water-logged soil, general uncleanliness, and steady high temperature of about 80° F. for a considerable period.

These conditions are especially observable in and about Vera Cruz, Tampico, and other harbors on the Mexican coast; on the Spanish Main; in the West Indies; on the west coast of Africa, and in most of the islands off that coast; and are, or have been for the time being, more or less approximated by the ports and places in which the disease has prevailed in the United States.

Most students of yellow-fever are familiar with the history of its introduction to Ascension and Prince islands many years ago by infected British men-of-war from the west coast of Africa, and of its terrible malignancy—well-nigh destroying the whole population. The incident was regarded at the time as conclusive evidence of the personal contagiousness of the disease. No account was taken of the luxuriant vegetable growth and underlying smouldering mass of moisture-retaining

débris in process of putrefaction as a prominent feature of these localities. But, shortly thereafter, the agency of this special feature, as the means by which the disease was introduced and propagated, was abundantly demonstrated by the resort of infected ships to St. Helena, in the same climate—an island devoid of such conditions; an almost bare rock, with but little or no débris, thoroughly washed by every down-fall of rain, where the disease was, and still is, found to be non-communicable; where it has never been introduced, although this island has been the resort of infected vessels from the African coast for cleansing for three quarters of a century.

On the 9th day of July, 1856, the alluvial plain of sand at Fort Hamilton and Bay Ridge, forming the east side of the Narrows of the upper bay of New York, was subjected to an unusually heavy rain (1.80 inches), which, from the conformation of the soil, could not run off: it was water-logged. Succeeding this, followed a drought and high temperature, the mean of which, recorded at seven, two, and nine o'clock daily, was 82° 58′ F., and ranging as high as 99°. On the 27th, thermometer at two o'clock, 95°; 28th, 97°; on the 29th it fell to 80°.

The mean of the hygrometric observations for the same period was 75° 80′, and for the nineteen days, inclusive, from the 9th to the 28th, there had been but .01 inch of rain—on the 15th. On the 29th it rained .30 inches. During this period the wind ranged from S. W. to N. W.; from 21st to 29th, from S. W. only.[1]

During this drought and high temperature the sandy plain at Fort Hamilton and Bay Ridge was probably several degrees hotter than the atmosphere, which increased the facility of evaporating the rain which it had absorbed, and filled the air with moisture. Unfortunately, these conditions were exposed to a line of yellow-fever infected ships anchored within a few hundred yards of the shore in the trend of the then prevailing winds. These were the circumstances under which the disease was introduced.

The first case occurred July 29th. Subsequently, between that time and about the middle of October, there were one hundred and seventy-four other cases, limited to the soil-saturated sandy district. The paved streets, which shed the water and were to a greater or less extent under-drained, marked the boundary. There was no quarantine of the district, and during the daytime, especially, it was frequently visited by residents from the outside. *Ten* cases only occurred within the limits of paved streets in Brooklyn, and *thirty-four* in New York. Every one of these forty-four cases was traced by the late Dr. Elisha Harris and the writer to *infected places* or *things*, and there was no evidence whatever of the disease having been communicated by any one person to another, though there were numerous opportunities for it to have so been had it been personally communicable.

For example: Dr. Joseph H. Bailey, U. S. A., surgeon of Fort Hamilton at the time the fort became infected, was a subject of the fever, was

[1] Abstract of Meteorological Register of Fort Hamilton.

a patient of the writer's, and extremely ill. Fearing the worst result in the infected place, the writer had him carefully transferred on a bed, in an easy-going and well covered market-wagon, to the nursing care of his wife, at the residence of his brother on Fourteenth street, New York, for which the public was none the wiser at the time, and attended him daily until his recovery.

Six years subsequent to the Bay Ridge epidemic in 1862, the writer had charge of the yellow-fever hospital ship in the lower bay of New York, and during the while, with a number of yellow-fever patients on board, he permitted the wife of Lieutenant-Commander John Van Ness Philip, U. S. N., to come and remain on board several days, to watch over and bathe the brow of her husband while he was *in extremis* with black vomit, to hold his hand at death, and to attend the burial. Thence she returned to and remained for several days at the Mansion House, Brooklyn, and to her home. Nothing but good ever came of it. And during the same service, the United States steamer Delaware arrived from Port Royal, with over one hundred of crew and invalid soldiers on board, infected with yellow-fever, from which there had been three deaths during the voyage, and were then three cases transferred to the hospital. The great danger of forty-six invalid soldiers, and more than as many more of other persons on board the infected steamer who had not had the disease, was urged upon the commissioners of quarantine as reason for the utmost despatch in providing for them a place of safety. Three days were fruitlessly spent in the effort; meanwhile, new cases occurred among them, and were transferred to the hospital daily, until there were in all seventeen cases. Impatient at the continued delay and increasing prevalence of the disease, the writer took the responsibility of having every person on board the Delaware, except necessary keepers, washed and dressed in *new flannel suits* (sailors' shirts and pants) procured for the purpose, and transferred to the hospital, where he provided them quarters, and *from that time there was not another case of fever among them*, though there were five cases on the day before. So much for *elimination* as against development under changed conditions.

Other examples might be cited, but these should suffice to illustrate the benefits to the rescued, and the immunity of the rescuers in cases of yellow-fever, always bearing in mind, however, the importance of the utmost restriction against *fomites*. For example: During the writer's service as superintendent of the hospital ship, he was sent for by one of his colleagues of the Brooklyn city hospital to a case of black vomit and death of a woman in that institution, who had contracted the disease a few days before from washing the clothes of her husband, which had been packed up on board of and sent from a gunboat at New Orleans three months before.

Again, of another kind: During a snow-storm in the month of February, 1864, the writer was sent for, in consultation, to a sailor with black vomit, at the house of his sister in Brooklyn, who had left a vessel in Philadelphia on account of feeling sick forty-eight hours before. Six

hours after death a careful post-mortem examination was made, fully justifying the diagnosis of yellow-fever made on the first view of the case. The writer communicated an account of the case to the late Dr. R. La Roche, the celebrated authority on yellow-fever, who found that the man had arrived at Philadelphia two weeks before in a brig from Kingston, Jamaica, which was exceedingly filthy, and especially in the forecastle where the man slept, and where he had put up a stove and raised a high temperature a few days before he was taken sick.

This case is a suggestive example of the danger to Florida, and the more in consequence of the wide dissemination of *fomites* by smugglers, who are believed to be responsible for the introduction of the fever there by this means. How long the germs of yellow-fever will live under such congenial conditions of climate and localities as those of Florida is not known. That the fever will cease to prevail even during moderately cold weather, without frost, as it does annually on the setting in of the northers in Vera Cruz, is perfectly consistent with its nature everywhere. But in the absence of persistent freezing weather, such as never occurs in Florida, the destruction of the germs of the disease will depend upon the efficiency and thoroughness of the processes of disinfection.

It would be an easy matter to cite examples of recurring outbreaks of yellow-fever after long intervals, where it has been once introduced, which cannot be accounted for in any other way than by the indefinite vitality of the germ under conditions favorable to its preservation.

The writer does not deem it necessary to refer to his inspections at New Orleans, Memphis, and other places in the service of the National Board of Health in 1879, any further than to state that it would be an easy matter to extend this sketch by many other citations showing that while yellow-fever is eminently portable to places of like conditions to those in which it commonly prevails by means of *fomites*—clothing, books, dunnage, certain articles of merchandise, ballast, and, above all, by filthy vessels—the disease is not personally contagious, and that during the prevalence of an epidemic in any place, everybody, divested of *fomites*, should be encouraged and aided so far as practicable to escape from it as the surest means of safety.

And with regard to the sick with the disease, they should be cared for under such circumstances as will most conduce to their recovery; and as they cannot communicate the disease to any other person, to remove fugitives from infected places who may be taken sick in healthful places *in transitu* or otherwise, to out-of-the-way places from the care of their friends, or to contagious-diseases hospitals, is alike calculated at least to impede recovery and to alarm the public on a false issue.

IX.

REPORT OF THE COMMITTEE ON THE POLLUTION OF WATER SUPPLIES.

In its report at the last meeting of the Association your committee explained in brief the ground of its belief in the harmfulness of sewage in waters used as potable supplies, whether these were derived from wells or larger sources; whether the water-supply of an isolated dwelling or that of a populous city. Chemical analysis was shown to be in most instances inadequate to the detection of sewage, unless the sewage was present in unusual quantity, or the water unusually free from other organic matters; and the conclusion was reached that the inability of the chemical methods is of no practical importance, as the presence of sewage in the water-supply can be determined by the sanitary inspector; and further, that for protective purposes the knowledge that sewage enters the water is all that seems to be required, because where there is sewage there is danger of typhoid infection.

Your committee desires to give special emphasis to the last stated clause, because it believes that the endemicity of typhoid fever in our cities is in great part due to the sewage in the water-supply. Many of our public water-supplies contain sewage, and its harmfulness in a general way is unquestioned even by those who have a financial interest in them. Yet there appears to be a hesitancy to acknowledge the real, the specific, danger. Typhoid fever is present in all our cities, giving annual death-rates of from 15 to 100 and over in every 100,000 of the population; but in the enumeration of its causes its prevalence is ascribed to many insanitary conditions before mention is made of the public water-supply. It is allowed in certain local epidemics to be propagated from wells which have become infected by an infected sewage, but the sewage in the public supply is seldom considered other than as a sentimental objection to the use of the water. It is allowed in many instances to arise from leaks in the plumbing of houses, by which exhalations from infected sewers reach the interior of the dwelling, but the water-supply into which the sewage of these very sewers is poured is used without a thought of its deadly qualities, unless, as in the case of Plymouth, Pa., the fact is forced upon the public mind that a public water-supply has as little disinfecting power over the germs of typhoid fever as the private water supply of an infected well. Health officers condemn the well, and generally it is closed as soon as it is found that sewage percolates through its area

of drainage;—they should condemn the public supply on the same grounds.

The large financial interests involved in the establishment of a public water-supply may be assumed to be at the bottom of this hesitancy to acknowledge the specific danger attaching to the presence of sewage. Millions of dollars, perhaps, have been invested in that water-supply, and many more millions would be required to replace it by water from a purer source. These large sums are alone considered, and not the vast and annually increasing totals of the loss by sickness and death that might have been prevented. A public or private well involves but a small sum, so small that it does not stand in the way of sanitary progress. It is closed, and with its closure one more possible centre of typhoid infection is removed; but the decreasing influence exercised by this on the annual rate of prevalence is small indeed if the public supply continue to disseminate the disease. The dollars and cents represented by the existing water-works may be regarded as a barricade to sanitary progress, or an altar on which typhoid fever sacrifices its victims.

The efforts that have been made from time to time to quiet the public mind by demonstrating the destruction of sewage and the self-purification of the water which contained it, are in part attributable to these financial interests; but only in part, for many sanitary inquirers have been deceived by partial or imperfect observations. Unfortunately, however, those analysts who have had much practical experience in following the track of sewage in its passage down-stream recognize in this so-called self-purification only the results of sedimentation and dilution. Undoubtedly the natural processes of purification,—the transformation of organic matter into ammonia, and the nitrification of the latter,—operate in the current of a running stream; but these account for but a small proportion of the seeming purification, and there is no ground for supposing that the infectious principle of typhoid fever is given up to the action of these purifying agencies. We acknowledge that typhoid fever is propagated by an infected sewage in a well-water when all organic trace of the sewage has disappeared through the instrumentality of the agencies referred to. There are two kinds of organic matter in the dangerous sewage,—matter which, by the absence of life, is given up to decomposition and reduction to harmless inorganic forms, and matter which by its vitality is preserved from these influences; and we acknowledge that in the well-water the former may be reduced, while the latter retains the full measure of its virulence. Analogy shows conditions of a similar character affecting our river-supplies, and the seeming apathy with which they are regarded can only be accounted for by assuming that individually we have fought against the barricade erected by the dollars and cents, and been defeated by its solidity and strength.

In this country the relation between the distribution of a water which contains sewage and the prevalence of typhoid fever can be readily observed by any one who studies the mortality returns of our cities in connection with the *character* of their water-supply. The records in

many instances are complete and trustworthy for the past twenty years. Brooklyn, New York city, Boston, Cincinnati, Philadelphia, etc., have a death-rate from typhoid fever proportioned to the quantity of sewage which enters their water-supplies. Where the water-supply, as in the first mentioned city, is free from sewage, the death-rate is low, about 15 in every 100,000 of the population, these cases being due to indirect infection and other local causes. When care is exercised in excluding sewage from the water-shed which furnishes the public supply, there is a corresponding freedom from typhoid fever, as in New York, which has a rate of 25, and Boston, which loses about 40 annually for every 100,000 of her people. In Philadelphia and other cities, in which less attention is given to the purity of the public supply, the typhoid death-rates are correspondingly increased. Moreover, the records of some of these cities give interesting information when viewed in connection with the *history* of the water-supply. The city of Baltimore has had a steadily diminishing rate since its water-supply was first introduced, and this decrease has been more notable since 1880, when the supply was largely extended. And this same city of Baltimore shows that its improved condition is not due to the introduction of a system of sewerage, but to the use of a purer water than was formerly furnished by its infected wells. Ordinarily a sewerage system and public water-supply are contemporaneous improvements, and heretofore any benefit to the health of the community has been credited to the sewerage, although it seems as if the inflow of a wholesome water had really more to do with the lessened death-rate, for the small typhoid rate of New Orleans, Louisiana, cannot be attributed to the sewers of that city, since it has none; but it *may* be attributed to the water-supply, for that consists of rain-water, which is free from sewage inasmuch as the cisterns in which it is stored are not sunk in the soil, but raised considerably above the surface.

Testimony of a similar character has recently been developed by the experience of Vienna. In that city, from 1851 to 1874, well-water of an impure character was used to a large extent in addition to a systematized supply from the Danube. During this period the deaths from typhoid fever ranged from 100 to 340 annually in every 100,000 of the population. In the last mentioned year a spring-water was introduced, and the death-rate from typhoid fever fell immediately to 50. Since then, by the disuse of impure wells and the extension of the new supply, the rate for the past three years has fallen to 11; and, inasmuch as the sewerage system was in existence during the period of high rates, the fall since 1874 is necessarily referred to the use of a water which is free from sewage. The fall in the typhoid rate experienced an interruption in 1877, when, owing to the freezing of some of the sources of the spring-supply, the water of the Danube had to be pumped into certain of the mains; and it is of importance to observe that the sections of the city which were chiefly affected by this epidemic were those in which the Danube water was distributed. According to Professor Nothnagel, typhoid fever has become such a rarity since the introduction of the spring-supply that

when a case occasionally comes to hospital from outside the city he shows it to the students as one of unusual interest.

In the face of such testimony to the influence of a pure water on the typhoid rate, we cannot shut our eyes to the relation that exists between sewage in our streams and typhoid fever in the cities that are supplied by them, no matter how great may be the financial interests that are involved or sunk in the contaminated supplies. Now comes the inquiry, What are the measures that have been or should be adopted to lessen the evil ?

As a rule the only effort made by our municipal authorities and water companies to purify our public supplies is by sedimentation. They select a pond which forms a natural sedimenting reservoir, or they throw a dam across a stream to form an artificial one, or, in the case of large water-courses, they pump directly from the stream into specially prepared basins. Primarily these basins or reservoirs were intended to facilitate distribution and guard against a temporarily inadequate flow in the stream which furnishes the supply ; but they were found to answer the purpose of clearing, and to that extent of purifying, a turbid water, provided they were large enough to permit the water to remain undisturbed for the needful length of time. When it is proposed to have additions made to the water-supply of a city, the construction of new basins is usually implied. As an instance, there are now at the city of St. Louis, Missouri, four settling basins, holding eighteen million gallons each. The floors are paved with brick on edge, and slope towards the centre and the river side. The sediment is floated off from the floor of each basin once in about four months, the quantity removed annually amounting nearly to 200,000 cubic yards. The wants of the city permit the water to settle only from eight to eighteen hours, while a period of thirty hours is required for a satisfactory subsidence. On this account an extension of the work is at present in contemplation. Surveys have been made, and land purchased, for larger settling-basins and conduits to carry the water to the present high-service or clear-water pumping-plant. The estimated cost of these improvements is three and a half million dollars.

The storage of a turbid water in such basins undoubtedly tends to improve its quality. No argument is required to show that the St. Louis water is better with its suspended matters at the bottom of the reservoirs than choking the distributing pipes, collecting in every containing vessel in the city or settling in the alimentary tract of the water consumers. The subsidence of the inorganic matters which constitute the mass of the turbidity carries down a considerable proportion of the associated organic materials, and the clear water gives markedly better results as well on chemical analysis as on bacteriological examination.

Chemically considered, the tendency of the cleared water is to further purification. Organic matter steadily diminishes in quantity, and is replaced by ammonia and nitrates ; but as this is effected by bacterial agencies, biologically the stored water progressively deteriorates after it

has become clear by sedimentation. The bacteria increase at the expense of the organic matters which they destroy. A water which every chemist and every bacteriologist would pronounce a fair sample of potable water will be found, after a week of storage, to be swarming with bacteria. Daily experience forbids the condemnation of a good water merely because it has been stored for a week; yet the bacterial colonies that may be developed from it are infinitely more numerous than those that are found in a water which is impure even to the senses. Indeed, the bacteria in an ordinarily pure water, after storage, may be vastly more numerous than in another portion of the same water intentionally contaminated with sewage or other impurity and similarly stored for the same length of time. This it is which deprives the bacterial cultivations of that value which but a short time ago they were expected to develop as indices of the wholesomeness or unwholesomeness of a water. A chemical evidence demonstrating a tendency to purification by the conversion of organic matter into nitrates, through the instrumentality of bacterial organisms, is more consistent with every-day observation than the bacteriological evidence which suggests unwholesomeness by demonstrating the numbers of the bacteria.

But although the general tendency is to the reduction of organic matter in stored waters, it often happens, particularly if the water is rich in ammonia or easily decomposed albuminoids, that vegetable growths other than bacteria will be developed, giving a bad taste or odor to the water, and perhaps causing diarrhœa in the consumers. These, which may be considered the accidents of storage, have been studied by many health boards and water companies; and the influence of heat, aeration, exposure to sunlight, etc., on their development, has been determined with practical benefit in many cases.

Sedimentation is sometimes an exceedingly slow process, particularly when the mineral particles consist of finely divided clay. A week or more is required in some instances to give a clear water, and this involves a large expenditure for storage-basins. Hence, many have turned their thoughts to filtration as a prompt and efficient means of purification. Filtering-beds are in general use in England, but in this country they have been constructed only by a few cities, and in an experimental way. The results do not appear to have been satisfactory. The expenses attending them are large, and the coldness of our winters begets difficulties which have not to be encountered in the milder climate of England.

But the failure of filtration on the large scale, and the imperfect results of sedimentation as carried on in the reservoirs, have given an impetus to the construction of filters for domestic use; and the success which has attended attempts to supply a clear water to manufactories and other large establishments has gradually led to more ambitious efforts. Of late some municipalities have investigated the means by which this filtration is effected; and the ability of the filters to supply a clear water on the large scale appears to have been demonstrated. As the method is patented, a certain hesitancy has been manifested by members of the Associa-

tion in referring to it; but, patented or not patented, if it have a value above others in supplying a pure water, we should have full accounts from such of our members as have a practical knowledge of its operations in all their aspects. A member of the American Water-Works Association did not hesitate, at its last meeting, to invite attention to the success achieved at Atlanta, Georgia. He expressed himself as knowing but little of the chemical improvement that took place in the quality of the water, but so far as the mechanical results of the filtration were concerned he was perfectly satisfied. The surface of the water in the impounding reservoir is nineteen feet above the layer of coke and sand which constitutes the filter-bed, through which it is carried by gravity into the clear-water basin. The reservoir-water is generally so muddy from red clay and other suspended impurities that it is rarely fit for bathing or laundry uses; yet in the clear-water basin small objects may be plainly seen through it at a distance of twenty feet. The capacity is three million gallons daily, although the quantity actually filtered for distribution at the time of the report was only two million gallons. The cost of the filters and clear-water basin was $55,000, and the daily expenses eight dollars for alum and two dollars and fifty cents for labor.

So much experience has been gained in the construction of these filters that filtration can no doubt be effected more rapidly and economically under the supervision of the patentees, than on new plans which must be at first regarded as merely experimental. But if the attention of boards of health, water companies, and sanitary engineers were directed to the development of the best filtering-plant, other and better methods might be suggested and carried into practice; or, if the patent process were proved to be superior to all others, the ability to express a prompt approval would be substituted for our present hesitancy. The passage of water through a filter-bed, the regular cleaning of the filtering material, and the addition of alum, iron, lime, or other precipitant, to the water, are the essentials of the process; but the patents necessarily cover only the specific mechanism by which these are brought into operation in that particular process. The natural laws of filtration, and of mechanical and chemical action, are open to the ingenuity of the world.

Recently Mr. L. H. Gardner, of New Orleans, has been experimenting on the large scale with solutions of iron, not as an adjuvant to filtration, but to hasten sedimentation in the settling-basins. Iron as a precipitating or filtering agent has been used in various forms and to a considerable extent, on the large scale, as a water-purifier since Medlock, in 1857, patented a process in which water was treated by contact with metallic iron. Spongy iron attained even a popular repute as a filtering material, but at the present time in Europe it has been displaced by the Anderson process, which is said to be in successful operation at Antwerp, Ostend, Paris, and Vienna. The water in this process is first partially sedimented and then forced through a revolving purifier consisting essentially of a wrought-iron cylinder mounted on hollow trunnions, which serve for inlet and outlet pipes. Curved ledges, running lengthwise of the cylinder on

its inner surface, scoop up and shower down fine borings of cast-iron through the current of the water. By the combined action of the cylinder and the water-current every portion of the latter is brought into contact with the iron, the particles of which are kept constantly bright by friction against each other and the sides of the cylinder. After this the water is passed through sand filter-beds to remove excess of iron. The results claimed are that the organic matter is altered in its chemical nature, and the albuminoid ammonia lessened from one fourth to one half of its original amount; that the water is softened, the scale in boilers becoming greatly reduced, open, friable, and loosely adherent to the plates; and that the microscopic life of the water is, to a large extent, destroyed or removed. At Antwerp the quantity of water thus treated is two million gallons daily, and the engineer in charge of the works and the municipal authorities have expressed their satisfaction with the results attained.

The various methods of purification by iron that have been tried in Europe involve the contact of the water with natural or prepared ore or cast-iron borings or turnings, with a subsequent filtration through sand to eliminate any excess of iron; but Mr. Gardner has suggested the introduction of a solution of iron in the precise quantity needful for the desired purpose. He tried a solution of red hæmatite ore in hydrochloric acid on Mississippi water at the New Orleans water-works, and the clarified water gave satisfactory results to Professor Chandler, of New York, and other chemists. Later, he treated a body of thirteen million gallons in the St. Louis settling-basins. The solution used, the water in various stages of precipitation, and the clear resultant water, all met with favorable reports from the analysts. The action is chemical, not mechanical. The combinations of lime and magnesia in the Mississippi water become converted into chlorides by the chlorine of the iron solution, and the precipitated oxide of iron settles promptly, carrying the suspended matters with it, and leaving the water clear. A solution of the specific gravity 1.6 in the proportion of one part to 20,000, clarifies the muddiest of river-waters without hardening them or leaving in them any excess of the precipitant. The Mississippi water at New Orleans can be thus clarified by a rest of eight hours in the reservoir at an expense of one cent for every thousand gallons. Mr. Gardner's object at the present time is to procure a cheaper iron solution.

In the efforts to attain to a prompt and efficient method of purifying water by sedimentation or filtration, with or without the use of precipitants, it is of the utmost importance that the object of the purification be kept steadily in view lest we fall into the error of supposing that the end has been accomplished when a clear water has been obtained. The agents of a certain patent filter place in the show windows of some prominent store two companion glass jars, one filled with an opaque and discolored turbidity overlying a stratum of heavy sediment, and labelled "Water taken this morning from the public mains;" the other, sparkling like a consolidation of dew-drops, and labelled "The public water after

passing through so-and-so's filter." A glance at these gratifies the passer-by, by seeming to instil into his mind so much sanitary knowledge. They sow seeds of reflection which develop and multiply with bacterial fecundity, so that in a few minutes they have done the work of an octavo pamphlet on "Potable water: its impurities and the methods by which they are removed." But the sparkle of the filtered water, although honest in itself, hides a fallacy which undermines the whole of the suggested argument. It must be remembered that clear waters are not necessarily wholesome waters. Their sparkle is no proof of their purity. From the laundresses' point of view, or the paper-makers', the result is satisfactory; but the object of the filtration of a water-supply for domestic or public service is its wholesomeness when used for drinking, and its transparency gives no testimony on this subject.

During sedimentation the heavier and grosser particles of mineral matter readily subside, and carry down with them much of the flocculent organic matter which would otherwise continue in suspension for many days. The effect of sedimentation at St. Louis, Missouri, has been mentioned, but it will perhaps be better appreciated when stated in other words. The lake-supply of Cleveland, Ohio, which is usually of excellent quality, is occasionally turbid, particularly during the spring months. When in this condition of turbidity the twenty million gallons, which are distributed daily, contain ten and a half tons of suspended matters, and the odd half ton consists of decomposing organic substances. Who will say that the city of Cleveland would not be benefited if it did not have that daily distribution of half a ton of semi-putrefaction? But sedimentation does more than free the water from suspended matters. During the so many hours or days of its continuance the processes of nature are at work transforming the semi-putrified matters into ammonia and nitric acid, both of which are harmless in the quantities present. The purifying influence of sedimentation may be easily determined by chemical analysis, and in many cases it is so marked as to render the process of infinite value in the absence of a better method.

Most surface waters, which are turbid from particles of mineral matter, contain the germs of nitrification, and the process of purification takes place in them during storage; but if these germs be absent, months may pass with but little improvement in the character of the stored water. Hence, cisterns which do not contain these bacteria have usually a less pure water, as judged by the ammonia and albuminoid ammonia which it yields, than those which do contain them. Where wooden tanks, as at New Orleans and other southern towns, are used for storage, it is a common occurrence for the analyst to find water of poor quality in new or recently cleaned cisterns, while water of a much better quality is discovered in those that have not been cleaned for a year or two, and have a fermenting sediment a foot or more in depth covering their floor. The nitrifying agencies accumulate with the sediment, and, notwithstanding the sediment, they succeed in reducing the organic matter of the water to the inorganic condition. The sediment is thus an advantage, but the

end is better accomplished by keeping it out of the cistern and introducing the bacterial workers through the medium of a layer of clean gravel or sand.

But withal, it must be remembered that it is only organic matter in a state of decay that is thus reduced to the inorganic condition, and only organic matter in a tangible form that is thus carried down by the heavier particles of the mineral sediment. Organic matters that are endowed with vitality remain uninfluenced by the destructive and reconstructive bacterial agencies that are operating in the water; and these, as has been seen, are the matters from which most is to be feared if sewage has unfortunately had access to the supply. The infected water which prostrated 1,200 of the 8,000 inhabitants of Plymouth, Pa., and killed 130 of those whom it prostrated, passed through three storage reservoirs on its way to accomplish its deadly mission.

Nor is filtration more efficient as a purifier when viewed from the stand-point which sees typhoid fever disseminated by an infected sewage in the water-supply. A satisfactory filtration removes the haze or cloudiness which may pervade a sedimented water for days after the grosser particles have subsided, and in so far its results are better than those generally effected by sedimentation. The finer particles of clay, some no larger than barely distinguishable molecules under the ordinary working powers of the microscope, are removed, and with them organic shreds of similarly minute size, and even many of the bacterial germs which were present. A water thus freed from foreign matter in suspension seems to offer the lustre of its transparency as a voucher or visible symbol of its purity, and chemical analysis may show in it only the merest trace of organic matter in solution, for the processes of decomposition and recomposition of the organic elements take place with much greater rapidity when the water percolates through the pores of the soil, as in the natural process of filtration, than when it is merely stagnant in a reservoir or flowing in the current of a stream. It is now well known that the bacterial agencies which effect these changes have their habitat in the three or four feet of soil which constitutes the surface of the earth, and that in soaking through this layer the organic matters of a water are transformed into matters which the roots of living plants can absorb and assimilate. Chemical analysis may therefore show in such a water merely the small quantities of ammonia or nitric acid which are the results of this bacterial action, and the water may be claimed to be pure on much stronger evidence than can be advanced on behalf of any water which is massed on the surface in a lake, pond, river-bed, or settling-basin, these surface waters having at work in them only those straggling bacteria that have been washed from their habitat in the soil into the current of the stream. In fact, so far as can be demonstrated by chemical tests, the naturally-filtered water may be free from everything of an organic nature.

In view of our knowledge of the conditions needful to a perfect natural filtration, it is impossible to allow that artificial means, operating after

nature's methods, will ever produce as pure a supply as can be procured in suitable localities by digging a hole in the ground. Comparatively speaking, only a small quantity of rain falls on a stated area,—a depth of so many inches during the course of a year,—and of this a large proportion is turned aside for the general police of the surface, and, having fulfilled its mission, is carried off by surface channels to the ocean, while another part of the fall cools the overheated surface of the soil by its evaporation, and gives the air that proportion of moisture which is needful to the continuance of life under present conditions. Only a few inches of the annual rainfall penetrates the soil, and, escaping the roots of the living vegetation, collects on the surface of some impervious stratum as the surplus water poured into a flower-pot drains into the saucer below. Artificial filtration has neither the time nor the surface to effect percolation after nature's method. Filtering-beds of gravel are prepared which permit more water to pass through them in a day than nature percolates through the same area in a year, or special filters are constructed which transmit, under pressure, as much water in half an hour as nature purifies on the same area annually. The bacteria of nitrification cannot be harnessed to the work of artificial filtration, and hence the results of such methods, although manifesting a satisfactory freedom from suspended matters, can in no instance compare with the organic purity which characterizes the spring- and well-waters that are found in the laboratory of nature. Since the bacteria of the artificial filtering-beds are unable to deal with the organic matters dissolved in the percolating water, it is needless to expect them to reduce the masses of organic matter which in progress of time clog the filter with their accumulated foulness, and lessen its efficiency as a filtering medium. The artificial filter cannot, therefore, furnish a water which will be as pure as a naturally pure water. In fact, artificial filtration amounts to little more than the mechanical separation of a water from its suspended particles, while the essential of natural filtration is the thorough nitrification of the albuminoids of the water, the removal of suspended matters being incidental and merely secondary.

The decay of once living organisms, animal or vegetable, gives more or less taint of a putrefactive nature to the surface-waters of the earth, and this taint, when of sufficient strength, is known to induce diarrhœal tendencies in the human system. Moreover, among the fermentations which take place during the destruction of organic matter, is one which gives origin to an influence,—the malarial,—which is always disabling, and often deadly, to human life, pervading the surface-waters to a dangerous extent, particularly in warm climates and seasons. By the process of filtration nature removes both the putrescent and malarial taints from the water, yielding a supply which is held to be pure and wholesome by the ever-increasing testimony of the generations of the world. The malarial influence is attributed to a micro-organism. If this view be correct,—and the tendency of medical science is to accept it as the only theory which gives a satisfactory explanation of the malarial phe-

nomena,—the vitality of the germ should preserve it from the putrefactive and nitrifying agencies, for these operate only on dead matter. It is therefore probable that only the mechanical part of the process of natural filtration is concerned in the removal of the malarial influence from a water, and that an artificial filtration which gives satisfactory mechanical results will be of value in the prevention of malarial disease.

Although the bacteria of the soil do their work so thoroughly that no chemical trace of existing organic matter can be found in the percolated water, it sometimes happens that this water is unwholesome. When collected at a distance from the haunts of man, it is as pure as it looks, for nature's methods always suffice for her necessities; but where the activities of human life create artificial conditions, such as result from the aggregation of individuals in cities and towns, her methods fail because they cannot be carried out. The soil becomes more and more contaminated by animal excreta, and the wells reservoirs in which are collected the leachings or washings of this impurity. If the impure soil be colonized by the infection of typhoid fever, it is immediately converted into a breeding ground for the germs of that disease. The vitality of these germs preserves them from putrefactive agencies, and their size seems to offer no obstacle to their passage through the soil. They therefore drain into the well, and confer upon its clear waters powers of a most deadly character. In the records of sanitary science are to be found many epidemics of typhoid fever chargeable to wells that have become contaminated by sewage. Indeed, the more the transmission of typhoid fever is studied, the more evident it is that the water-supply is the main agency concerned in its propagation. Hence, sanitary officers have not only closed up wells into which sewage has entered, but those which, from their situation, are merely exposed to this danger.

Since natural filtration is powerless against the infection of typhoid, it is evident that artificial methods can give no guaranty of protection.

The purifying influence of precipitation by means of such chemicals as alum, iron, or lime can readily be demonstrated by chemical analysis. The hydrated alumina, ferric oxide, and lime carbonate, as they materialize into particulate existence from their solution in the water, entangle and carry down with them organic particles that would otherwise be less easily removed; and biological research shows that bacterial germs are swept from the water in like manner. That this operation is imperfect is demonstrated by the number of colonies which can be developed from the cleared water; that it is purely mechanical and not germicidal is indicated by our experimental knowledge of the action of such substances on various bacterial organisms, and by the fact that their presence does not exercise even an antiseptic influence on the bacteria of the water, as the number of these bacteria subsequently increases in the cleared water as rapidly as in a stored water which has had no such chemical treatment. The commercial interests concerned in artificial filtration invest these substances with the title of coagulants, as if the albuminoid constituents of inorganic life curdled into a bacterial *rigor mortis* as soon

as the water became pervaded with the presence of the precipitant; but there is no warrant for a belief in any protective virtue other than that connected with a mechanical entanglement and precipitation.

The processes of purification that have just been reviewed remove suspended matters and more or less of the dissolved saline and organic substances that are present in the water, but none of them can lay claim to the removal or destruction of the causative agencies of the acute infectious diseases that are known to be propagated by an infected water-supply. These processes have been closely studied by the English sanitary authorities, who long ago came to the conclusion that sewage in a water is harmful because it may contain the germ of cholera or typhoid fever, against which the most efficient method of artificial filtration constitutes no effective safeguard. Hence, the object of sanitary legislation in England is not to preserve the rivers as a drinking-supply, but to prevent them from becoming a nuisance in their character of open sewers. The solids of sewage consist of a highly nitrogenized organic matter, the proper disposition of which in the economy of nature is as materials for the growth of the vegetable kingdom, and if these be separated, the water may be purified by percolation and filtration and returned to the rivers. Sewage has accordingly been treated in various ways for the separation of the solids and the reclamation of its water. In country houses and small communities a cesspool can be provided for the deposition of solids, the liquid overflow being conveyed by drain-pipes into the soil. The effluent water in such cases may be as pure to chemical tests as that of the stream into which it is discharged. But as communities grow, the difficulties attending the disposition of their sewage are proportionately augmented.

Various methods of precipitation have been tried with the view of paying expenses by the sale of the solids as a fertilizing material, while the separated liquids are turned into the water-courses, with or without an intermediate filtration through the soil. Sewage irrigation has also been tried on the large scale, and in many instances with satisfactory results. The advocates of irrigation point with considerable enthusiasm to the purity of the effluent water, and consider that this system will ultimately settle the vexed question of the disposition of sewage; and, indeed, such is the purifying influence of the soil, that the clear water of the outflow gives relatively good results on analysis. But, as we have seen in speaking of sewage-polluted wells, the purity which is evidenced by chemical tests fails to give an assurance of protection from typhoid fever, and it is this protection, not chemical purity, which is the object in view. These advocates claim that typhoid fever does not prevail in the fields which receive the sewage of an infected city, but it is the propagation by drinking-water, not by exhalation, in which we are interested, and typhoid fever is known to have prevailed on fields where the effluent water was used for drinking. Indeed, how could we expect otherwise when we know that typhoid fever is propagated by an infected sewage in a well-water which has undergone a more efficient filtration through

the soil than that to which the sewage is subjected in the irrigating fields, or when we remember that the spring-waters which occasioned the epidemic at Lauzen were derived from a sewage-polluted stream spread over the fields of an adjoining valley for purposes of irrigation?

In view of the considerations which we have thus briefly reviewed, we cite the opinion of the English commissioners, to give it greater emphasis as reaffirmed after the passage of years which have added much to our knowledge of the propagation of infectious diseases by means of the water-supply: "Of all the processes which have been proposed for the purification of water or of water polluted by excrementitious matters, there is not one which is sufficiently effective to warrant the use, for dietetic purposes, of water which has been so contaminated. In our own opinion, therefore, rivers which have received sewage, even if that sewage has been purified before its discharge, are not safe sources of potable water." A water to which sewage has access should from that fact alone be excluded from all further consideration as a possible water-supply for drinking purposes.

The introduction of a water-supply into a growing city is ordinarily only a question of money. Engineering difficulties fade into insignificance when surveyed from a satisfactory financial standpoint. It is often said to be beyond the power of money to purchase health, but the sanitary student can readily demonstrate that in many cases this is not so. Money expended in the distribution of a wholesome water-supply will purchase health for the thousands who otherwise fall victims to the fever which is endemic in our cities and towns. Typhoid fever is a disease to which every one is exposed. The susceptibility to it is inherent in our constitutions, and, so far as we know, immunity can be purchased only by submitting to attack. Ordinarily the human constitution succumbs to its influence before maturity is reached, but if up to that period we fortunately escape, we have no assurance of future immunity. Uncertainty overhangs us like a cloud. Danger is as present with us in the daily routine of our peaceful lives as on the battle-field, only that the embodiment of evil is an invisible and intangible germ instead of a fast-flying bullet. Danger flows beside us in our streams, in our mains, from the taps in our houses. The germ of the disease may not be in this pitcherful or in that, in this tumblerful or in that, but it will find us some day if we continue to use the water which contains it. In a town of 50,000 inhabitants one victim is taken daily, and as the average duration of this disease is about a month, there are always in that city thirty persons whose lives are unnecessarily trembling in the balance.

What is the local suffering from yellow fever in Jacksonville, Pensacola, or New Orleans, once in so many years, compared with the totality of the destruction caused by the steady progress of this general and ever-present scourge? Thirty thousand people die of typhoid fever annually in the United States of America, and Vienna lowered her losses by this fever from 340 to 11 annually in every 100,000 of her population by introducing a spring-water supply instead of the sewage-tainted

waters of the Danube. Calculate the loss by sickness associated with these 30,000 deaths,—the loss of work, the unprofitable work of nursing, and the actual outlay necessitated by each visitation of the disease,—and you will find that saving money by drinking sewage in the water-supply is a penny-wise policy that in the long run will fail to pay even for the funerals and the mourning goods.

In many instances it is, on this continent, an easy matter to obtain a suitable supply for a community. Some neighboring lake offers itself as a natural reservoir, requiring only the construction of conduits for the transmission of its waters; or an artificial reservoir may be formed by damming certain of the radicles of a neighboring stream. The drainage area of this supply must be kept under the closest supervision by the sanitary authorities of the community, for it is not enough to obtain a supply which is free from sewage: it must be kept so. Constant vigilance is the price of safety. The sanitary inspector should be ever on guard and familiar with every square yard of the surface, and the health authorities should be empowered to protect the many against the carelessness or wanton encroachments of the few. The question of water-supply is here reduced to its simplest terms: the raising of sufficient money to bring in the wholesome water, and the investment of the health officer with power to preserve the wholesome quality of the public supply and to prevent the use of water from sources which are known to be unwholesome.

In other instances, it is difficult to obtain a suitable water-supply. The whole face of the country has been more or less settled, and the natural drainage of every valley brings sewage and manufacturing waste into its outflowing stream. Nevertheless, now is the time to act, for these unfavorable conditions will increase and multiply in the future, so that what may be done now cannot be done then without a tenfold expenditure of time and money. Fortunately, when difficulties occur from the density of the settlement, there is also more wealth to meet the increased expenditure, but it is beyond the power of that wealth to give life to those who have in the meantime fallen victims, or consolation to the hearts that are in mourning. What is to be done should in all cases be done at once. It is *we* who are interested in this matter,—now, in our own time and generation: for what does it avail us that the city is supplied with pure water ten years hence, if at that time it be remarked of us, Oh, yes, I remember him well; he died of typhoid fever eight or nine years ago. And it is an easy matter to so arrange the financial burden that part of it shall fall on those who will hereafter participate in the benefits.

In well settled sections of the country it may be impossible for the towns and villages to obtain a water free from sewage in their main streams or their neighboring tributaries, and equally impossible for any one of them to go to the nearest sources of pure water for a supply, but those favorably situated for combined action may easily perfect their arrangements for bringing in the water from long distances. Nor should

it be forgotten that if water free from sewage is not to be obtained on the neighboring surface, it may sometimes be found beneath the surface, as at Brooklyn, L. I., or, more notably, at Memphis, Tenn., where, after a thorough investigation of the whole subject by a committee of citizens, it was ultimately developed that they had a source of the purest water within a hundred yards of their domestic hearths.

Many communities have a water-supply which was pure enough when originally introduced, but which has become dangerous by the subsequent growth and development of which it formed the nucleus. A water-bed or basin cannot be used for concurrent purposes of water-supply and sewage discharge. If the drainage area be given up to settlement and commercial enterprise, with their consequent sewage and manufacturing waste, the city must be prepared to find another source of supply for its daily wants, or pay the penalty of an increased death-rate from preventable disease. In the race for material prosperity this penalty is too often forgotten, and the endemic fever is regarded as one of those visitations of Providence that are inevitably consequent upon conditions of aggregation. Yet every intelligent medical man knows the fallacy of this reasoning, and that the progress of this malady can be checked by suitable measures as surely as exotic disease can be kept out of the country by properly enforced restrictions on commerce. To permit the citizen to enjoy life, which, according to the constitution of the United States, is his right, the most stringent laws should be enforced to preserve the purity of the supply of drinking-water; or, if the settlements on the area are too valuable to be destroyed, a new source of supply should be obtained and guarded.

The protection of the citizen requires that every advantage be taken of our knowledge of the natural history of the typhoid infection, that it may be destroyed before reaching any of our water-courses. It is well enough to insist upon the purification of sewage by processes of precipitation, filtration, or irrigation before its water is delivered into the natural courses, for thereby the latter will be prevented from falling into the condition of open sewers, which is the lot of so many small streams in well peopled districts; but these processes cannot be depended upon to remove the typhoid infection. This infection passes from the patient to our surface-waters directly by the sewers, or it drains through the soil with the subsoil-water, and reaches the surface on some lower level. Of course in either case it may be lost in the mass of water in which it is diffused, but it was not so lost at Plymouth nor at Lauzen. To protect the citizen and stamp out this fever, it should be made the duty of every medical man who attends a case of fever to see that the excreta are disinfected before being consigned to the sink, cesspool, or sewers, and the utmost care in this regard should be taken in cases occurring on a watershed which is utilized for a public supply. So far as our knowledge goes, sewage would be deprived of that which, under ordinary conditions, constitutes its only dangerous element, were this system of bedroom disinfection efficiently practised.

Local authorities, such as water companies and boards, citizens' committees, health boards, and commissioners, should exercise a jealous guard over the public water-supply; but in many instances these would be powerless without the intervention and coöperation of the authorities of the state. Massachusetts, Illinois, and Minnesota have already taken steps in this direction. In the first mentioned state the board of health is invested with the general supervision of the water-supplies. No sewage, drainage, excrement, or other refuse or polluting matter of such kind or amount as—either by itself or in connection with other matter—will corrupt or impair the purity of a water used for domestic purposes, is permitted to be delivered into a water-course or any of its feeders within twenty miles above the point where a water-supply is taken. Upon the application of a city or town to the supreme court, alleging the pollution of its water-supply in violation of law, an injunction may be issued, or the polluting substances required to be so cleaned or purified that they shall no longer be deleterious. The limit of twenty miles in this law is a defect, but sanitary legislation is a thing of slow progress, and our friends in Massachusetts undoubtedly secured as much as was possible for them to obtain at the time.

The board is required to examine the waters from time to time, for the purpose of ascertaining whether they are adapted for use as domestic water-supplies, or are likely to impair the interests or imperil the health of the public. It is required to conduct experiments to determine the best practicable methods of purification, of drainage, and of the disposal of refuse, and to recommend measures for the preservation of the purity of the waters. Moreover, it is the legally constituted adviser of cities, towns, corporations, firms, or individuals, in matters pertaining to the introduction of water-supplies or sewerage systems, making use of its knowledge and facilities on their behalf in regard to source and quality of water and methods of sewage disposal, having regard to the present and prospective needs and interests of other communities or individuals that might be affected thereby. The approval of the board is a legal requirement to the consideration by the legislature of any application for authority to introduce any system of water-supply or sewerage.

The board is also empowered to consult with and advise those engaged, or intending to engage, in any manufacturing or other business as to the best practicable method of intercepting, purifying, or disposing of any drainage or refuse that might result from the business to the detriment of the waters of the state. It is required to bring to the notice of the attorney-general all instances which may come to its knowledge of omission to comply with existing laws respecting the pollution of water-supplies and inland waters, and to report to the legislature any specific cases not covered by the provisions of existing laws which, in its opinion, call for further legislation. Finally, and very materially, the board is provided with funds to sustain the corps of engineers, chemists, and inspectors, whose labors are needful to the proper performance of its duties.

The report of the board's proceedings under these heads, submitted to the legislature in January of this year, shows the excellent work that may be accomplished in this way. Eleven applications from cities and towns for advice concerning water-supplies were received; eleven for advice concerning sewerage; two soliciting action to prevent the contamination of particular water-supplies; and one from a manufacturer for advice concerning the disposal of drainage from certain works which he purposed establishing. The important question of a water-supply for the cities of Boston, Chelsea, and Somerville, and the town of Everett, was one of those that came before the board. There are 123 sources of public water-supply in the state; but over 200 samples are investigated chemically and biologically every month, the samples being from rivers, ponds, and other sources that may be utilized in the future. Experiments are also in progress on methods of sewage-disposal, which will add considerably to our knowledge of the results which may be obtained in that direction.

With the aid of the state, the local authorities in their efforts to obtain and preserve a wholesome water-supply would experience no difficulty that could not be overcome by the expenditure of the necessary funds. The twenty-mile limit will in progress of time be blotted out, and the waters of the state be sharply divided into those which may be used as sources of domestic supply and those which carry off the waste water. The water-supply and sewerage systems of the state—of the country—should be as distinct as those of every household, and the sooner this is accomplished the sooner will the rates of sickness and death be decreased among our people.

Your committee, therefore, urge a livelier interest in this important matter on the part of state boards of health, an interest which is not satisfied with discussing and subscribing to sanitary views of the subject, but which will leave nothing undone that will tend to invest them with power to act for the preservation of the public health. With all our boards operating, each within its domain, there would be no need of a committee of this Association to investigate the subject of water-pollution. In concluding, we submit the following resolution:

Resolved, That it is the well considered belief of this ASSOCIATION that it is an imperative necessity, especially in the more populous states, that state legislatures should give their boards of health that financial support which would enable them to act intelligently on all questions pertaining to the public water-supplies, investing them at the same time with the supervision of the said supplies, and with power to preserve these waters from contamination by sewage or other injurious matters.

CHARLES SMART.
S. W. ABBOTT.
G. C. ASHMUN.
W. W. DANIELLS.
EDWARD PLAYTER.

X.

REPORT OF SPECIAL COMMITTEE

APPOINTED BY BOARD OF HEALTH OF PITTSBURGH, PA., TO EXAMINE THE SOUTHSIDE WATER-SUPPLY, AND TO INQUIRE INTO THE CAUSE OF THE PRESENT EPIDEMIC OF TYPHOID FEVER IN THAT SECTION OF THE CITY, DECEMBER 12, 1887.

PITTSBURGH, DECEMBER 23, 1887.

TO THE BOARD OF HEALTH:

Gentlemen: Your committee, appointed to examine the Southside water-supply and inquire into the cause of the present epidemic of typhoid fever in that section of the city, beg leave to report that they engaged Hugo Blauck, Professor of Chemistry in the Western Pennsylvania Medical College, and in the Pittsburgh College of Pharmacy, and Messrs. Hunt and Clapp, chemists, of this city, to make a chemical analysis of water from the following places:

1. From the mouth of the influent pipe of the Monongahela Water Company's works at South 30th street.
2. From the receiving basin of said works.
3. From distributing basin of same.
4. From tank in 31st ward.
5. From Southside hydrant.
6. By way of comparison, from hydrant in this city supplied from Pittsburgh Water-Works.

They also engaged Dr. E. A. Mundorff, Professor of Microscopy and General Pathology in the Western Pennsylvania Medical College, and Prof. J. H. Logan, Demonstrator of Microscopy in the same institution, to make microscopical examinations of water from the same points.

The reports of these gentlemen are herewith submitted as part of this report, and marked respectively A, B, C, and D.

To summarize these reports: The chemical analyses show that the water supplied to the Southside by the Monongahela Water Company, as compared with the water furnished from the Pittsburgh Water-Works, contains 100 per cent. more total solids, fixed solids, organic matter, free ammonia, albuminoid ammonia, chlorine, nitric and nitrous acids, and about 500 per cent. more sulphuric acid.

These chemical analyses also demonstrate the fact that the water, as taken about twelve inches from the bottom of the river at the mouth of the influent pipe, contains a smaller amount of total solids, less chlorine, sulphuric, nitric, and nitrous acids, and free ammonia, and 40 to 75 per cent. less organic matter, than the water found in the tanks and drawn from the hydrants. This can only be accounted for by the solid and organic matter being drawn into the pipes in the process of pumping.

The permanent hardness of the Monongahela water, as examined, is from 100 to 150 per cent. greater than that drawn from hydrants in Old City.

The microscopical examinations demonstrate the presence of epithelium, bacteria, micrococci, and vegetable organisms in great abundance. They also demonstrate the presence of a large amount of organic excrementitious matter.

No epithelium was found in the samples taken in the Old City. The number of bacteria, micrococci, and vegetable organisms was much less than in the Southside water. The mineral deposit was not as great, and the yellow rosettes of organic excrementitious matter were wanting.

The sketches of the organisms found, as obtained by the use of the camera lucida, and submitted by Prof. Mundorff, are worthy of study, as he submits the microscopic appearances of fresh stools from a typhoid fever patient. Comparing these with the bacteria found in the water supplied to the Southside, the family resemblance is found to be decidedly pronounced.

On Friday, December 16, your committee visited the pumping-station at South 30th street, and found that the influent pipe of the water-works extends about 125 feet from the edge of the water at the present time. The mouth of said influent pipe is about 150 feet above the Monongahela Connecting Railway Company's bridge, and directly in line with the first pier of the same. Three or four squares above the influent pipe the shore extends out quite a distance beyond the shore line at 30th street. A short distance below the bridge the shore again pushes out beyond the line at 30th street. Between these points there is little or no current. This space of still water is used as a harbor or mooring-place for boat-houses, barges, rafts, etc., and the excrement from those occupying and working on and about them is dropped into the water in the vicinity of the influent pipe daily.

The 30th street sewer, which drains quite a large area and the car-stables in the immediate vicinity, empties against or rather alongside of the abutment of the Monongahela Connecting Railway Company's bridge, 150 feet below the influent pipe. Just at the point where the 30th street sewer empties, the discharge from a smaller sewer, with an abrupt fall from Jones's and Laughlin's mills, strikes it at right angles, and the velocity with which the contents of this sewer are poured out will tend to force the flow from both sewers in the direction of the first pier of the bridge. There being but little current at this point, the contents of the sewers being disseminated in the direction of the pier, and this pier being in a direct line with the mouth of the influent pipe and but a short distance below, forming an eddy with what little current there is, it cannot well be otherwise than that a portion of the contents of these sewers is deposited in the immediate vicinity of the mouth of the influent pipe.

The reservoirs were next visited. The water in them was muddy, turbid, and, to say the least, uninviting in appearance. The walls of

the reservoirs, some five feet of water having been let out in the morning, showed a crust of from one to three inches of mud, in many places mixed with green fungous masses.

Proceeding to Beck's run, which empties into the Monongahela about a mile above the pumping-station, your committee found that the people living along this run, with an utter disregard for the health of others, have many of their privy wells so constructed as to drain directly into the run. The drippings from the animals in their stables are carried off through the same channel. The water laden with animal matter that flows into this run from a schindery affords excellent pabulum for the development of any disease germs that from other sources may find their way into this stream.

Your committee, being informed that typhoid fever was prevalent along this run, and in territory contiguous to and draining into it, but outside the city limits, made an investigation, with the following result:

Since August 1 there have been 14 cases of typhoid fever on Beck's run, and on Heslauch's run and the territory draining into it (all of which is emptied into Beck's run) there have been 42 cases of typhoid fever, developing, as near as can be ascertained, about as follows: August 1 to 15, 2 cases; September 1, 2 cases; October 1 to 15, 14 cases; October 15 to 31, 5 cases; November 1 to 15, 19 cases; December 1 to 15, 14 cases;—total, 56 cases. Of these, five died. By comparing the returns of typhoid fever cases from the Southside with the statement given above, it will be seen that they follow closely on the development of the cases in this territory.

About November 15, the time at which the greatest number of cases existed in this locality, there were slight rains, sufficient to wash the surface of the ground and increase somewhat the volume of water in the run. In from ten to twelve days from this time the disease spread with fearful rapidity on the Southside.

Has this been the source of contamination? The concurrence of dates would seem to prove it. In further support of the probability of this being the source of infection, let us quote the opinion of Dr. H. R. O'Connor, who attended about half of these cases. He says,—"The people on Beck's run who had the fever drained their cesspools into the run. The people living in the locality drained by Heslauch's run, and who had the fever, cleaned their cesspools, and used the contents for fertilizing purposes. The rain we had just before the epidemic started washed the excrement from these typhoid fever patients down to the river, thus causing an epidemic in the city."

The filth poured into the river from Beck's run and the 30th street sewer is not by any means the only source of contamination. Lining the banks of the river for sixteen miles are the 14th, 22d, and 23d wards of this city, and the towns of Homestead, Braddock, and McKeesport, with an aggregate population of from 40,000 to 60,000 people. The sewage from the towns mentioned is continually flowing into the river.

As a remedy, would the extension of the influent pipe of the Monon-

gahela Water Company's Works, from the eddy to the channel, afford relief, and render the water-supply safe? In the judgment of your committee, it would not, for the following reasons: The distance from the towns mentioned to the influent pipe is not sufficient for purification to take place as it flows down, and especially is it insufficient, in a sluggish stream like the Monongahela, laden at all times with large quantities of organic matter and obstructed by dams. Further, the whole pool from which the water is drawn is polluted by the flow from the large sewers on South 20th and 27th streets, and by the drainage from a part of the 13th, 14th, 22d, and 23d wards, which pours into the pool at a point directly opposite to or above the influent pipe. The obstruction created by the dam causes a deposit of organic matter, even in the channel and far up the pool.

The wells now being sunk by the company, if they should prove sufficient for supply, will not, in our judgment, prove remedial. If the water flows from the river, the filter thus formed will remove much of the organic matter, but the water, laden with germs of disease, will still be unsafe. If the flow should be toward the river, it will carry with it the drainage from the innumerable cesspools immediately above.

We are firmly of the opinion that water supplied from the Monongahela river, within twenty or twenty-five miles of the city, is now and will continue to be a constant menace to the health and lives of the citizens of the Southside.

Your committee is informed that typhoid fever has been prevailing more or less at McKeesport during the summer, and we are not entirely clear that the germs of the earliest cases on the Southside were not derived from that source.

For years the death-rate on the Southside has been abnormally large. Epidemics attack them with great frequency and virulence, and the percentage of deaths from infectious diseases, as compared with other sections of the city, has been shamefully, if not criminally, large. In proof of these assertions, we submit the following table, compiled from the records of the board of health:

EXHIBIT "E."

Population of Southside 27 *per cent. of entire population of city average for* 11 *years.*

Percentage of Mortality from Infectious Diseases on Total Mortality of District.				Percentage of Deaths from Infectious Diseases.	Per cent. of Total Mortality.
Year.	Old City.	East End.	Southside.	Southside.	Southside.
1876	18.8	17.6	24.5	38.2	32.0
1877	27.7	17.7	44.7	48.8	36.0
1878	28.1	20.4	41.1	43.2	33.4
1879	22.8	24.3	34.4	41.3	32.8
1880	22.5	28.5	37.9	43.1	33.4
1881	31.6	33.0	34.5	33.9	32.4
1882	23.5	24.0	27.8	34.3	30.8
1883	16.2	14.9	22.5	41.2	32.6
1884	12.7	16.6	26.7	48.9	36.5
1885	17.3	18.2	22.5	37.1	31.7
1886	16.0	21.1	24.4	39.4	33.2
Total	21.56	21.48	31.0	40.8	33.1

This table shows that for a period of eleven years from January 1, 1876, to December 31, 1886, the percentage of mortality from infectious diseases on the total mortality of the district has been as follows: Old City, 21.56; East End, 21.48; Southside, 31.00. Percentage of deaths from infectious diseases, Southside, 40.8 per cent. of total death-rate of city from infectious diseases. Per cent. of total mortality, Southside, 33.1. In other words, the percentage of mortality from infectious diseases on the total mortality has been for eleven years 9.5 per cent. greater on the Southside than in the other districts of the city. The Southside contains 27 per cent. of the population of the city, but for eleven years it has averaged about 41 per cent. of all the deaths from infectious diseases occurring in the city, or 14 per cent. more than its just proportion. During the same period it has had over 33 per cent. of all the deaths occurring in the city, or 6 per cent. more than its proper ratio.

Since the first day of January, 1887, to date, 2,037 cases of typhoid fever have been reported to the board. Of these, 278 occurred in the Old City, 406 in the East End, and 1,353, or 66 per cent. of the whole number, on the Southside.

This may be partly due to the character of the soil on the hillsides, causing frequent overflowing of the privy wells. It may be partly due to the many old wells that years ago were filled up without being cleaned; but there is no doubt in our minds that the character of the water-supply is and has been largely responsible for this unhappy condition of affairs.

A continuation of such a water-supply for twenty years to come, with the yearly increase of contamination that in the nature or character of the surroundings is inevitable, means to the Southside and to the city at large, leaving out all sentiment and taking only a business view of it, a great loss in production on account of sickness and disability. It means a great loss in the increase of wealth that would accrue from this production. It means thousands of deaths, the money value of which, if added to the loss in production, would be more than sufficient to procure a good water-supply, if it had to be brought a hundred miles.

Let us analyze this assertion, and see if it is correct.

The death-rate on the Southside is 6 per cent. of the total death-rate greater than that of the balance of the city. With the present population of the Southside, that means one death per annum for every 170 inhabitants over and above the death-rate in the rest of the city, or 260 deaths per annum more than their just percentage.

The cash value of a human life to a community has often been computed, and it is a moderate estimate to average the lives lost at $1,275. Two hundred and sixty lives lost, worth $1,275 each, is $331,500. Burial expenses, $50 each, is $13,000. But as for every death there are many ill who recover, let us, as an average, place the death-rate at 10 per cent. That would mean 2,600 people ill. The average time that they would be compelled to remain unemployed or unproductive would be about thirty days. This would give us 78,000 days lost time. From this, let us deduct 15 per cent. for those below the productive period of life, and we have 66,300 days' labor lost. Placing the average value of a day's work at $1.25, we have a loss of $82,875. Add one fourth to this for time lost by others in, or money paid out for, nursing, 31 cents per day, which is a moderate estimate, amounting to $20,718. Add $2 to each case for medicine, which amounts to $5,200. Let us now add, as the value of the product of the labor or the increase of wealth accruing therefrom,—and it is a low estimate to place it at one third of the day's wages, or 42 cents per day,—this amounts to $27,625. This sums up as follows:

260 lives, at $1,275,	$331,500
260 funerals, at $50,	13,000
66,300 days' work, at $1.25,	82,875
One fourth of this, or 16,575 days, at $1.25, time lost in or paid for nursing,	20,718
2,600 cases, at $2 each for medicine,	5,200
Wealth accruing from product of labor, estimated at one third of the day's wages,	27,625
Total,	$480,918

The approximate loss to the Southside is thus seen to be about $481,000 more than its just proportion. Twenty-five per cent. of the amount thus lost would, if properly invested for sanitary purposes, be sufficient to reduce the death-rate of the whole city very materially; and if the whole amount thus lost were invested for a few years in improving the water-supply, it would be sufficient to bring it 100 miles, if that were necessary. The loss is sufficient to pay for the entire plant of the Monongahela Water Company in five years, valuing the plant at $2,500,000. This annual loss to the Southside is more than the city is willing to pay in twenty-five years for purposes of protection, judging from the meagre appropriations for sanitary purposes in the past.

As to the water supplied from wells on the Southside, your committee would say that well-water in a densely populated district is always open to suspicion, and is generally dangerous. But so far as the wells on the Southside are concerned, the water from them looks better, smells better, tastes better, and if it is not better it certainly cannot be much worse, than that supplied by the Monongahela Water Company. In our judgment, therefore, it would be impolitic to close these wells at the present time.

The only feasible remedy that appears to your committee is to have the water from the Pittsburgh Water-Works supplied to the Southside. The connection once made, it would be economy for the city to purchase the plant of the Monongahela Water Company at any reasonable price, and shut off the supply from the Monongahela river at once and forever.

Respectfully submitted,

J. C. Dunn,
James McCann,
Crosby Gray,
Committee.

EXHIBIT "A."

Pittsburgh, December 22, 1887.

To the Board of Health of the City of Pittsburgh:

Gentlemen: I herewith submit a report of the six analyses of water you ordered to be made, December 12, 1887.

All statements in this schedule are based upon 1000 c.c.m. or one liter.

Determination.	Southside Reservoir No. 1.	Southside Reservoir No. 2.	Monongahela River Influent Pipe.	Southside Hydrant.	31st Ward Tank.	Pittsburgh Hydrant.
Total solids	0.0844	0.1690	0.0952	0.1620	0.1482	0.1200
Organic matter . .	0.0338	0.0370	0.0292	0.0620	0.0318	0.0316
Chlorine (Cl) . . .	0.0195	0.0177	0.0179	0.0179	0.0213	0.0106
Sulphuric acid (SO) .	0.0446	0.0484	0.0441	0.0504	0.0523	0.0094
Nitrous acid (N_2O_3) .	0.0010	0.0012	0.0009	0.0015	0.0012	traces

Determination.	Southside Reservoir No. 2.	Southside Reservoir No. 2.	Monongahela River Influent Pipe.	Southside Hydrant.	31st Ward Tank.	Pittsburgh Hydrant.
Nitric acid (N_2O_5) .	0.0028	0.0028	0.0022	0.0030	0.0029	traces
Free ammonia (NH_3)	0.000105	0.000154	0.000153	0.000125	0.000215	0.00003
Albuminoid ammonia	0.00011	0.00010	0.00039	0.00027	0.00018	0.00014
Temporary hardness .	2.6	2.6	2.5	2.6	2.75	1.5

The hardness of the water is calculated upon 100,000 c.c.m. containing one gramm of oxide of lime (CAO), or its equivalent in oxide of magnesium (or the sulphates of both). Permanent hardness is from one fourth to one half a degree less than the temporary hardness. In calculating hardness after the French method,—that is, one gramm of carbonate of calcium, or its equivalent in carbonate of magnesium in 100,000 c.c.m.,—we had to augment the degrees in the proportion 1 : 1.785 (French) or,—

Temporary hardness	4.64	4.64	4.46	4.64	4.90	2.67

From the statement of the hardness we are permitted to calculate that oxide of lime, or its equivalent of magnesia, is present in 1,000 c.c.m. of water.

Reservoir No. 1.	Reservoir No. 2.	Monongahela River.	Southside Hydrant.	31st Ward Tank.	Pittsburgh Hydrant.
0.026	0.026	0.025	0.026	0.027	0.015

The following schedule, showing the maximum of contents permitted in good drinking-water, will serve best to judge of the above analyzed water. The schedule is taken from the statement of several well known authorities, as Pettenkofer, Fisher, Reichardt, Committees on Water of Vienna, etc.

Total solids	in 1,000 c.c.m. of water not over		. . .	0.500	grms.
Organic matter	"	"	" . . .	0.050	"
Nitric acid	"	"	" . . .	0.027	"
Chlorine	"	"	" . . .	0.0355	"
Sulphuric acid	"	"	" . . .	0.100	"
Lime	"	"	" . . .	0.112	"

The hardness of water may not surpass 16.5 From this, we may learn that the water from the Pittsburgh hydrant is quite normal, while we find that the Southside water (taken next to a house where a sick person —typhoid malaria—had lived) is too high in organic matter (0.062).

The quantity of nitrous and nitric acid present in the Southside water points towards danger. The most dangerous constituents of the water

are the free ammonia and the albuminoid ammonia. So long as the free ammonia is in the water, as it is in the Pittsburgh hydrant water, it may be taken with impunity, but its presence in the Monongahela water warns us to abstain from it. The presence of albuminoid ammonia shows that the Pittsburgh hydrant water is also of a dangerous nature.

If we remember that nitrites and albuminoid matter are directly due to sewage contamination, we cannot do otherwise than regard the water of the Monongahela river, by passage through the two reservoirs and the 31st ward tank, as unhealthy.

Very respectfully,

HUGO BLANCK.

EXHIBIT "B."

PITTSBURGH, DECEMBER 21, 1887.

TO THE BOARD OF HEALTH:

Gentlemen: We enclose you a tabulated report of analyses which we have made of the samples of water.

We would say further, that the samples of water taken from the Southside are, as proven by these analyses, very impure, and totally unfit for drinking purposes. The best authorities say that potable waters, to be used by large communities, should not contain, in parts per hundred thousand, more than ten parts of total solids; not over .01 parts of free ammonia; not over .01 parts of albuminoid ammonia; not over 1 part of chlorine, nor .009 parts of nitrogen existing as nitrites and nitrates. The hardness of the water should not be over 8 degrees.

We do not mean to say that water containing an excess of any one of these ingredients in its analyses would be necessarily unfit for drinking purposes; but that samples of water which exceed in all or most of these constituents would be considered dangerous for use. Further, we would not state that the amount of ammonia and chlorine found in the water, which are in proportions very minute, are themselves the poisonous elements in the water, but simply that they are indicators of sewage contaminations; and when the proportions given above are exceeded, it is a sure indication that the water is contaminated with sewage or decomposing organic matter, which is very poisonous, and deleterious to health.

The amount of sulphuric acid in the samples of the Monongahela water also is very abnormal, and is of itself a very poisonous element in the water.

It is difficult, in fact it is impossible, in a water analysis, to state, upon any one ingredient, that because of its percentage the water is necessarily good or bad. The results have to be judged together in order to form an intelligent opinion of the matter. The results of the analyses of all the constituents of each of the samples of water taken on the Southside, taken as a whole, prove the water to be in a very dangerous condition for potable purposes.

Very respectfully,

PITTSBURGH TESTING LABORATORY,

HUNT & CLAPP.

REPORT OF TESTS MADE FOR THE BOARD OF HEALTH, PITTSBURGH, DECEMBER 21, 1887.

Results of Analyses of Seven Samples of Water, in parts per 100,000.

Determinations.	Sample No. 1. Southside Hydrant.	Sample No. 2. Southside Reservoir No. 1.	Sample No. 3. Southside Reservoir No. 2.	Sample No. 4. 31st Ward Tank.	Sample No. 5. Hydrant of Mr. Dixon. 31st Ward.	Sample No. 6. Monongahela River Influent Pipe.	Sample No. 7. Pittsburgh Hydrant.
Total solids	13.4	18.8	15.7	15.5	15.2	14.3	8.6
Organic matter . . .	3.6	4.8	3.0	5.0	4.6	2.8	2.6
Fixed solids	9.8	14.0	12.7	10.5	10.6	11.5	6.0
Free ammonia	0.026	0.0222	0.0268	0.0186	0.019	0.0202	0.0174
Albuminoid ammonia .	0.0294	0.0266	0.019	0.0166	0.0168	0.0246	0.017
Chlorine	1.134	1.260	1.066	0.995	1.000	0.775	0.78
Sulphuric acid	5.068	5.084	5.30	5.672	5.356	5.436	1.218
Nitric acid	0.093	0.083	0.102	0.056	0.081	0.083	0.129
Nitrous acid	none	none	none	none	none	none	none
Hardness	7.129	6.879	6.860	6.492	6.410	6.492	3.021

Traces of iron and magnesia in all the samples; Sample No. 7 contained the most iron. The solids mostly carbonate and sulphate of lime.

Very respectfully,

PITTSBURGH TESTING LABORATORY,

Hunt & Clapp.

EXHIBIT "C."

PITTSBURGH, DECEMBER 21, 1887.

TO THE BOARD OF HEALTH:

Gentlemen: In response to your request, I beg leave to submit the following as the result of my microscopic analyses of the Monongahela and the Allegheny river water:

1. Sample from Southside hydrant or tap in constant use: Bacteria in swarms, excrement and epithelium, vegetable fibres, granular sediment, mineral crystals.

2. Sample from river channel near mouth of influent pipe: Bacteria in large quantity, granular and crystalline matters, excrementitious matter, epithelium, infusoria—some dead—in small number, wood fibres.

3. Eastern reservoir, or No. 1, one sample: Bacteria in large quantity, excrementitious matters, epithelium, wood fibres, long filiform growths, springing from excrementitious débris.

4. Western reservoir, No. 2, one sample: Bacteria in large quantity, excrementitious masses, epithelium, vegetable fibres, crystalline substances, dark fungus or mineral substances, found in both pools.

5. Allentown tank: Bacteria in considerable numbers, excrementitious débris, epithelium, single and in masses; some small dead fish were observed floating in the tank.

6. Sample from Pittsburgh hydrant: Bacteria, vegetable fibres, crystals, etc.

By reference to the accompanying drawings[1] it will at once be seen how generally these bacteria are diffused. By comparing the proper drawings it will also be seen that the germs in the water appear in the stools of the typhoid patients. The specific germs which it is believed hold a causal relation to typhoid fever could not be identified, if present, without prolonged culture experiments.

The presence of non-specific bacteria, not to mention other forms of contamination, would favorably condition the spread of this epidemic.

By way of explanation, I would add that the bacteria are depicted in the drawings on a large scale, and in consequence greatly reduced in number. They represent sketches taken from aerial images of these micro-organisms, viewed through a $\frac{1}{8}$ objective and B eye-piece with camera lucida attached, the images thus formed being cast, so to speak, against a wall of the room, at a distance of a number of feet.

Very respectfully,

E. A. MUNDORFF.

EXHIBIT "D."

PITTSBURGH, DECEMBER 20, 1887.

TO THE BOARD OF HEALTH:

Gentlemen: Herewith please find results of microscopical examination of six samples of river water, as ordered by you last week.

Nos. 1 to 5 were taken by the inspector detailed by you for that pur-

[1] We regret that plates of the drawings mentioned were not furnished. SECRETARY.

pose and myself. They are fair average samples of Southside river water in its present condition. No. 6 was taken by myself, and is a fair sample of Pittsburgh hydrant water.

In all six samples there was little difference as to clearness, and to the casual observer the water would appear pure and wholesome. However, when held up to the light, innumerable minute particles could be seen suspended in the fluid. These consist of earthy particles and granular aggregations of organic matter, much of which is presumably the finely comminuted remains of the contents of sewers and other refuse thrown into the river. Occasionally a few minute specks, moving hither and thither, would indicate the presence of infusorial life. After standing five days, an exceedingly thin deposit of suspended solid matter was formed at the bottom of each jar.

The contents of each jar were examined in three different ways, each of which has the value in supplying additional data or verifying those already found.

1. A drop taken from the centre of each jar was carefully examined. Bacteria, particles of organic matter, and infusoria were easily found, thus indicating their presence in unusual numbers.

2. Some of the thin deposit at the bottom of each jar was carefully examined. Bacteria, infusoria, organic matter, and sporular forms of life, both animal and vegetable, were found in still greater abundance.

3. Drops taken from the centre of each jar were evaporated on clean slips of glass. Crystalline mineral matter held in solution is thus detected, and, furthermore, all the bacteria are obtained in one single layer, so that it becomes reasonably easy to form an accurate estimate as to their number. They are also much more plainly seen by this method.

A drop of water so evaporated forms a round or oval film from $\frac{3}{8}$ to $\frac{1}{2}$ inch in diameter, and is plainly visible to the naked eye, provided there is sufficient matter in solution. This was the case with all the samples, and indicated an excess of soluble matter. Absolutely pure water would dry up and leave no trace whatever.

As the power used in examining these films could show only from $\frac{1}{300}$ to $\frac{1}{250}$ of the whole area at a time, each film required the scanning of at least 250 separate areas or fields before its examination was complete. In each area examined the number of bacteria and micrococci averaged not less than 100, and sometimes was as high as 10,000. Taking the lower number, each drop must have contained 25,000 microbes.

It took eighty drops to fill a dram, and as an ordinary glass of water contains sixty-four drams or more, each drinker of unboiled Southside river water must have been gulping down bacteria at the rate of 125,000,000 per glass. This number placed side by side would form a film covering only one inch by two inches, so it will be readily seen that an ordinary glass is far from being crowded with so vast a multitude.

Whether bacteria are concerned in the epidemic of typhoid fever or not, it is very clear that our rivers are being badly polluted, and that all possible means should be taken to prevent it.

REPORT ON SIX SAMPLES OF RIVER WATER.

Sample No. 1. Taken about twelve inches above bottom of Monongahela river, at influent pipe, thirtieth street, Southside. Several forms of infusoria, among which were lyncrypta, bacteria, and micrococci, very numerous.

Evaporation yields dirty, yellow crystals in leaf-like expansions from margin of drop, besides isolated rosettes and square forms of the same. Another soluble substance solidified in round or oblong discs, or in masses with rounded or crenulated margins. Granular matter also present in small masses, and appears to consist of débris of animal and vegetable origin.

Sample No. 2. Taken from receiving compartment of reservoir at Thirtieth street, Southside. Water taken from surface, and about twelve feet out from sides of basin. Bacteria, micrococci, a few simple forms of infusoria. Crystals and other matter the same as in No. 1.

Sample No. 3. Taken from surface of distributing compartment, a few feet out from sides of basin, at Thirtieth street, Southside. Bacteria, micrococci, a few simple infusoria, crystals, and deposits as above.

In the sediment from this sample, two small but very active forms of amoeba were observed.

Sample No. 4. Taken from a hydrant at 12th street, just above Carson street, Southside. Bacteria, micrococci, a few infusoria, also crystals and deposits as above.

Sample No. 5. Taken from 31st Ward tank, Southside. Bacteria, micrococci, and simple forms of infusoria. Crystals and deposits the same as before. In the sediment of this sample the mycelium of a fungus was observed.

Sample No. 6. Taken from hydrant on Penn avenue, near Sixth street, Pittsburgh. Bacteria, micrococci, a few simple forms of infusoria, crystals like those of Southside water, but not in rosettes, and lighter in color. Crystalline matter, with crenulated margin, also present. If anything, bacteria and mineral matter somewhat less than in Southside water. Some diatoms and a beautiful species of vorticella were also obtained.

Yours very truly,

JAMES H. LOGAN.

XI.

THE ORIGIN AND PREVENTION OF TUBERCULOSIS.

By D. E. SALMON, D. V. M., Chief of Bureau of Animal Industry, Department of Agriculture.

Washington, D. C.

There can be little doubt in the mind of the thoughtful sanitarian that questions relating to the origin and prevention of tuberculosis will, for years to come, be among the most important subjects that will attract his attention.

In the census of 1880 there were reported for the year 91,551 deaths from consumption in the United States. We find it necessary to make a correction here, in order to give the actual mortality from this disease. The total number of deaths from all causes, reported to the census officers for that year, amounted to but 15.1 per thousand inhabitants, while they admit that the actual number of deaths was between 17 and 19 per thousand inhabitants, or, as nearly as could be ascertained, 18 per thousand. There were consequently 3 deaths per thousand inhabitants that were not reported; and to obtain the correct number we must increase the figures, as given in the census, to the extent of 20 per cent. Admitting now that the number of deaths from consumption should be increased in the same proportion as the general death rate, and we find that the mortality from this disease in 1880, instead of being 91,551, was actually 109,861.

Since 1880 the population of the United States has increased from about fifty million to over sixty million of people. If, therefore, we desire to know the actual mortality from consumption in this country at the present time, we must increase the figures given for 1880 by at least 20 per cent. This gives us as the present annual mortality 131,833.

Now, consumption, as we know, is but one form of tuberculosis. The bacillus of this disease, instead of selecting the lungs for its habitat, may prefer the brain or the abdominal organs, or other portions of the body. It may well be doubted if the number of deaths from these different forms of the malady can be calculated from existing data with even approximate accuracy; but I think it would be a moderate estimate to place the total annual number of deaths, now caused in the United States by the bacillus tuberculosis, at 150,000. We are so accustomed to using large numbers in this generation that there are few of us who stop to ask ourselves a question as to the significance of this enormous number of deaths in our country each year from this malady. It means that for every hour of the day and night not less than seventeen of our people fall victims to the

attacks of this insatiable microscopic destroyer. It means that within the brief space during which I occupy your attention this evening, more victims will be claimed in the United States by this ever-present demon than have fallen by the hand of the notorious Whitechapel fiend during the weeks that the world has been horrified by his crimes. And while in the latter case we should be inexpressibly shocked at any neglect on the part of the authorities which would tend to increase the number of deaths by a single victim from the slums of London, we see this other enemy of human life entering the homes of the high as well as the low, striking down indiscriminately the brightest, the loveliest, the most useful of our citizens;—and what are we doing to arrest its ravages? And to make the matter still worse, we know where the destroyer lives, and we have his photograph in our possession.

The blame for this apathy is not all to be placed upon sanitarians, however. We may be guilty with the rest of our people, but without a strong and enlightened public sentiment to support our boards of health, what can they do, in a work of this magnitude, which will largely increase their expenditures, and which demands the exercise of arbitrary power? Such a public sentiment is rapidly being formed; there is an increasing demand for adequate measures for the prevention of this disease; and I venture, therefore, to take up the matter in a general way, hoping that discussion will lead to further consideration, and that in the end our ideas may become better defined, and that action may be agreed upon, which will mitigate if it does not control the losses from this plague.

I assume that it is unnecessary before this Association to enter into any arguments to demonstrate that tuberculosis is a specific, communicable disease, that it is caused by the well defined germ which we know as the *bacillus tuberculosis*, and that without the presence of this particular germ the specific disease in question cannot be developed. With this admitted, it is extremely important for us to inquire where this microorganism lives and multiplies, how we come in contact with it, and by what channels it gains an entrance into the bodies of men and animals.

The careful investigation that has been made by scientists of the life-history, characters, and conditions of growth required by this microbe, makes it apparent that in our climate, at least, its multiplication does not occur outside of the human or animal body to a sufficient extent to demand the consideration of sanitarians. Its reproduction and development take place within the body, and every individual who is affected with it has obtained it, either directly or indirectly, from some other person or animal that was previously affected with it. These statements must be accepted as axioms by sanitarians before we can hope for substantial and satisfactory results in the prevention of this terrible malady.

The contagiousness of tuberculosis among cattle is so apparent that it was admitted on all sides by veterinarians long before Koch discovered or cultivated the parasite. With people, as you know, the case is different, and its contagiousness has been strongly contested; and it is only recently that sanitarians have generally admitted that it may occur in a

limited number of cases. From a study of the facts which bear upon this question, it appears to me that the greater contagiousness in the one case is due simply to the conditions of life. We know that when the lungs are affected, the sputum contains myriads of the peculiar germs of this disease, and that the dissemination of the germ from the diseased person must be chiefly through this medium. On the other hand, experiments make it reasonably plain that the germ must find its way into the body either by the respiratory organs, the alimentary canal, or through wounds on the surface of the body. It is apparent, therefore, that, with the conditions of life under which we live in this country, it is not to be expected that the contagiousness of tuberculosis can be made very clear except with persons in such relations as husband and wife, where saliva may be transferred in the act of kissing. But judging from the newspaper accounts of domestic infelicities, we should not be astonished at the rather rare cases which have been recorded where the disease was evidently contracted by the wife from the husband, or by the husband from the wife. Perhaps a more conclusive reason why such recorded cases are rare is the fact that the contagiousness of tuberculosis has not until recently been accepted by physicians ; and even now, a considerable proportion of all those who graduated longer ago than five years reject this doctrine, and have serious prejudices against it. As a result, I am convinced that many clear cases of contagion have not been referred to this cause.

Contagion from dried sputum, or that which is partially dried, would pass unnoticed, because people are nearly as much exposed to consumptives outside of their families as within them. Who has noticed the wholesale use of unwashed drinking-cups at our hotels, railway stations, and other public places, without seeing there a means by which the bacillus tuberculosis can be widely scattered by sputum or saliva without the remotest chance of tracing the contagion? Again: When we see how tuberculous sputum is distributed over our streets and sidewalks, to be dried by the winds, ground into powder by the feet, and then carried by currents of air into our mouths and nostrils, how can we expect to trace the entrance of this germ into the body, and determine by observations upon people whether it is or is not contagious from man to man? We are all more or less exposed to contagion from persons *outside* of our families; and if we do not contract the disease and die of it, it is probably because nature has endowed us with a degree of immunity which enables us to resist the dose of these germs which we are accustomed to take, and for that reason we are spared.

When we observe this disease as it occurs among cattle, we find it much simpler to trace the contagion. Different herds of such animals are practically isolated; and an outbreak of tuberculosis in a herd can usually be traced to the introduction of an affected animal. Owing to the opportunities for contagion,—feeding out of the same mangers, eating forage soiled by saliva, drinking from the same vessels,—the infectiousness of the disease is frequently extremely well marked. I know herds in which the malady has existed for years. There is one instance

in my mind where the introduction of a tuberculous cow, in a thorough-bred herd, affected nearly every animal, breaking up the herd, and causing a loss of from twenty to thirty thousand dollars. Instances where this disease is introduced and spreads through whole herds are now so frequent that every veterinarian I am acquainted with, who has a cattle practice, is thoroughly convinced not only that the malady is contagious, but that it is easily transmitted.

This brings up the question as to the identity of human and animal tuberculosis, and I unhesitatingly answer it in the affirmative. Not only are the germs in the two cases indistinguishable under the microscope, but their growth in different culture media and their other biological characters are identical. Again: The infection of swine, rabbits, fowls, etc., from man produces the same lesions as when these animals are infected from the bovine species. The infection of man from cattle is a proceeding which can hardly be undertaken experimentally, except in rare instances. It is said to have been successfully accomplished, however, in one case. What is of more consequence, we have the observations, which now begin to accumulate, connecting tuberculosis in man with the use of milk from tuberculous cows.

Admitting the identity of tuberculosis in man and animals, and many important questions suggest themselves to us in regard to the propagation and prevention of this disease. What animals have we to fear? What are the media of communication? How can we guard against infection? What momentous questions are these! I can only answer in general terms. The time at my disposal is too brief for details. Notwithstanding the fact that swine are very susceptible, as shown by experiments, tuberculosis in these animals appears to be a rare disease. This is probably, in some degree, because hogs are slaughtered at from six months to two years old, and there is not with them the opportunities for the development and propagation of a disease so slow in its progress. The same remark may be applied to fowls; so that for practical purposes it is the bovine species to which we must direct our attention as the one most frequently affected, and from which most danger is to be apprehended.

I am unable to give you data, to show the proportion of the cattle in this country which are affected. The disease is probably no greater than in other countries, but its widespread prevalence is certain. I have encountered it from the Atlantic ocean to the Rocky Mountains; and, having been no farther west, I cannot speak for the Pacific slope. It is most frequently seen in milch cows, but often also in beef cattle. An inspection of about half a million head of cattle, mostly dairy cows, which has been made during the last two years by the Bureau of Animal Industry in the work of eradicating pleuro-pneumonia, has brought herds affected with tuberculosis very frequently to my attention, on account of the difficulty which is sometimes met with in making a differential diagnosis.

Experiments upon other animals show that the contagion is contained in the tuberculous matter, in the liquids expressed from the affected

organs, often in the milk, and sometimes at least in the blood and in the juices expressed from the muscular tissue. Whether butter and cheese may serve as infecting material has never, to my knowledge, been determined. That oleomargarine, butterine, and similar mixtures, which contain oleo oil, a substance expressed at a low temperature from tissues frequently tuberculous, may also be infecting, goes without saying, if we accept the results of the experiments, to which allusion has just been made.

The effect of cooking upon tuberculous material has not been worked out as carefully as is desirable. The experiments of Toussaint and others, however, show that the disease is produced by infectious substances even after they have been subjected to a boiling temperature for a considerable time. The inference is, that beef cooked according to prevailing ideas, and particularly when very rare, has not been subjected to a sufficient temperature to destroy the germs. We conclude, therefore, that from a sanitary point of view bovine tuberculosis is dangerous to the public health, and that the contagion may be conveyed in either the beef or the milk.

With all these facts before us, what action is indicated to lessen the mortality caused by this disease? I have my doubts if direct contagion from affected people is a sufficiently important factor in the production of tuberculosis to warrant such action as would be needed for its prevention. Sputum might be disinfected more often than it is without causing hardship to any one. It appears out of the question to isolate affected persons, and I certainly have not the hardihood to attack the time-honored practice of kissing, even when restricted to husband and wife. And when it comes to kissing between lovers, and even among members of the fair sex when they meet and part, I must leave it to some of the older members of the Association to make recommendations. Drinking-vessels at water fountains and about public places might be kept cleaner than at present, and public sentiment created against their use in common to the extent now seen.

The most important matter, however, which presents itself to me is to guard the food-supply from contamination. The carcasses of tuberculous cattle or of other animals should be condemned and destroyed. Our dairy cattle should be inspected regularly, and every animal affected with this disease should be slaughtered, and put beyond the possibility of doing harm. If you ask for the details of this work, to whom it is to be entrusted, where is the money to come from, how marked the results will be upon human tuberculosis, I am not in a position to give satisfactory answers. My idea is, that as public sentiment develops, the boards of health will gradually cover this ground, and that all will see that the value of the work is greater than its cost. The complete eradication of tuberculosis may be a dream, but it is none the less a duty to protect the public health against its fatal contagion in every practicable way, and to stop its dissemination by tuberculous cattle appears to me the easiest and one of the most promising steps in this direction.

XII.

MEMORANDA OF VISITS TO THE QUARANTINE STATIONS OF THE MIDDLE ATLANTIC COAST, MADE DURING THE SUMMER OF 1888.

By BENJAMIN LEE, M. D., Ph. D., Secretary of the State Board of Health of Pennsylvania.

The recent reintroduction of small-pox into the United States from Europe, the advent of Asiatic cholera to our shores during the last twelve months, and the present devastation by yellow-fever of Southern cities, unhappily not under the ægis of a state board of health, give to the following notes of the condition and management of some of our more important quarantines an interest and importance which at another time they might not possess.

NEW YORK.

The residence of the health officer, Dr. William M. Smith, at Clifton, Staten Island, about five miles from the city of New York, at "The Narrows," which divides the harbor proper from the lower bay, was found presenting a general air of neglect and dilapidation, which was the index to the condition of the entire establishment. A destructive economy had evidently been practised for years, converting what was once a magnificently equipped station, erected at a cost of $2,000,000, into a series of virtual ruins. When it is remembered that seventy-five per cent. of the immigrants and eighty per cent. of the tonnage coming into the United States from foreign ports must be inspected and cared for by this service, the failure to provide the means for maintaining it in a state of thorough efficiency would be criminal were the state legislature composed of men of sufficient intelligence to be able to comprehend the enormity of the omission. Not that I would be considered as advancing the opinion that ports of less commercial importance need to be any less carefully provided for or less rigidly guarded, since a single infected vessel may endanger the entire country.

The quarantine ship "Illinois," formerly moored about four miles inside Sandy Hook, is a thing of the past. There is now, therefore, no boarding station below the health office. This is manifestly too near the city, and directly in the track of commerce. Vessels are not remanded to the quarantine anchorage in the lower bay unless infectious disease actually exists upon them. The only means of communication with vessels and with the hospital island is the tug George C. Preston, which is much too small, old, and out of repair. The landing was observed to

be in very bad condition,—the posts, timber, and flooring being much decayed, and the crib-work so worm-eaten that it had fallen several feet.

This office has telegraphic and telephonic communication with New York, and an observatory from which vessels may be sighted several miles down the bay. During the year 1887, 6,376 vessels from foreign ports were inspected, and 371,619 immigrants examined—an increase of 70,701 over the immigration of the previous year. Quarantine is continued throughout the year for all vessels from European ports, and from the fifth day of April to the first day of November, for all vessels from ports within the yellow-fever zone and infected ports of the United States.

The following circular of regulations, to be observed in immigrant steamers, has recently been issued:

RULES AND REGULATIONS

TO PREVENT THE INVASION OF INFECTIOUS AND CONTAGIOUS DISEASES AT THE PORT OF NEW YORK.

The great immigration which is entering our country from every port in the world, embracing as it does many people who come from localities where infectious and contagious diseases prevail, justifies the enforcement of the strictest quarantine rules for the exclusion of such diseases.

The following rules and regulations are necessary for the protection of the populations adjacent to the port of New York, and of the millions of inhabitants in interior communities, from the contagious and infectious diseases that are contracted in foreign ports and countries.

The owners and agents of passenger steamships from foreign ports will be financially benefited by aiding the quarantine authorities in securing a strict observance of the following rules :

1. Immigrants, on their arrival at the port of embarkation, should receive attention and direction from the agents of the line on which they embark, to prevent their having any communication with lodging-houses or other resorts suspected of being infected with contagious and infectious diseases. Frequent inspection of the records of the health department of the port of departure will contribute to discover infected places.

2. Immigrants should be inspected by an experienced physician as they go on board the steamer, and none but well persons be allowed to proceed.

3. Immigrants from a cholera district or country should be refused passage.

4. Adult persons from localities where small-pox prevails as an epidemic should be rejected unless good evidence is afforded that they have been vaccinated within the last five or six years, and except children less than ten years of age who have been vaccinated.

5. The examination of the steerage passengers, as to the necessity of their vaccination, should be commenced immediately after they are located on the steamer, and all adult persons vaccinated who have not been successfully vaccinated, *except* children under ten years of age, who bear good evidences of vaccination within the past six years. If the vaccination is successfully effected previous to the development of a case of small-pox among passengers, it will prevent the development of the contagion in those who have been exposed. It is therefore important that the vaccination should be effected soon after the passengers are received on board. Those who are successfully vaccinated by the surgeon of the steamer before the development of a case of small-pox will not be detained at quarantine.

6. To insure the success of the vaccinations made, the *vaccine* should not only be carefully selected, but after being obtained *must* be kept in a refrigerator. Two or three days of exposure to the heat of the quarters of the surgeon on board ship will insure its destruction.

7. Morning and evening inspection of the passengers, by having them pass before the medical officer, should not be neglected. The detection of a case of small-pox in the *initial* stage, and its immediate isolation, is very important.

Hospitals for the sick of contagious diseases should be located on the upper deck, forward or aft, and ventilated from the top;—never in rooms opening into "the steerage" or "gangways," whereby the contagion-poisoned atmosphere of the hospital may escape and infect all passengers.

8. The patient should not be allowed to leave the hospital, after entering it, until removed by the authorities at quarantine.

9. If the illness of the patient requires the care of an attendant, he should not be permitted to leave the hospital until the quarantine authorities direct.

10. The person who waits upon the patient and attendant should be one who has had the small-pox: such person should pass in the food and medicine without entering the hospital.

11. To prevent the escape of the patient, or communication with him by unauthorized persons, the hospital should be locked, and the key retained by the physician or a trusted attendant. The practice which, in some instances, has been adopted, of establishing a guard to prevent improper communications with the patient, is to be commended.

12. All openings which would permit the air of the hospital to be inhaled by well persons should be closed, and ventilation afforded from the top or the side toward the sea.

The faithful observance of these regulations will relieve the line, on whose steamer this disease develops, of vexatious delay and expense, and the people of this country from the danger of the introduction of this disease. The same precautions should be observed in respect to other contagious diseases.

According to section 6 of chapter 534 of the Statutes of New York, passed June 13, 1885, the following are the diseases against which maritime sanitary regulations apply, viz., "yellow-fever, measles, cholera, typhus or ship fever, small-pox, scarlatina, diphtheria, relapsing fever, and any disease of a contagious, infectious, or pestilential character, which shall be considered by the health officer dangerous to the public health."

Arrangements have been made with the medical officer at Castle Garden (the emigrant landing station) by which patients suffering with scarlatina and diphtheria can be removed from the steamer at quarantine, and taken to the reception hospital without passing through the Garden.

A circular has been addressed to the agents of all passenger lines, requesting that their medical officers shall exercise especial vigilance for the detection of these fatal and highly communicable diseases.

The mode of treatment of an infected vessel cannot be better described than by giving an account of that actually practised in the case of the steamer "Alesia," which arrived on the 23d of September last with five hundred and sixty Italian immigrants, eight of whom were ill with cholera, from which disease eight others had died during the passage.

"The closets of the steamer being in an extremely filthy condition, they were immediately drenched with a solution of bi-chloride of mercury (1 to 500); the water tanks were directed to be discharged at once; Croton water from New York was telegraphed for; and the steamer was ordered into the lower bay. The same day the immigrant passengers were removed from the steamer for observation. Four cases of cholera were discovered at the time of the transfer of the passengers that had not been detected by the steamer's surgeon, which, with those in the hospi-

tals of the steamer, were immediately transferred to the quarantine hospital. The disinfection of the steamer was commenced the morning after the removal of the sick and well immigrant passengers.

"The disinfection of the closets of the Alesia before mentioned was followed by a thorough washing with hot water from the boiler of the steamer by hose attachments. The steerage and spar decks were cleaned by the same means, which was followed by washing them with a solution of mercuric chloride.

"The dunnage of the crew was boiled for a considerable time by the introduction of steam into a cask of hot water in which the clothing was immersed. The mattresses and pillows were burned. Carpets, rugs, and every textile fabric in the steamer were subjected to the same treatment as the clothing. The hatches of the hold were then opened for the first time since the cargo was stowed at Marseilles and Naples. The greater part of the cargo was received at the former port, whence the steamer sailed for Naples the 29th of August, with no passengers in the steerage, and but three in the saloon. At Naples the Alesia received some cargo, consisting of boxes of maccaroni and fruit, and bags of beans, which were delivered by lighter, the steamer being anchored at some distance from the wharf. In this case, as in almost every other, when steamers receive steerage passengers, the cargo was received, and the hatches sealed, before the passengers were taken on board. The so called sealing of the hatches consists in calking them with oakum, covering them with heavy tarpaulins, and clamping them with iron bands which enclose the outside of the hatch and of the tarpaulin as well. The hatches are not opened after being thus closed until they reach the port of destination, and the cargo is as secure from infection from the decks above as if there were no opening between the hold and the decks. The cargo was displaced to the bottom of the hold, one hundred pounds of sulphur was burned in the hold, and the hatches of the spar deck were closed ten or twelve hours. The disinfection by the solution before mentioned was the next day repeated, every accessible portion of the vessel being washed with it by brooms or sponges, and was followed by the combustion of one hundred and fifty pounds of sulphur in the hold, the hatches being again closed until the following morning. Finally, all exposed portions of the steamer, except the saloons, including the forecastle, were repainted, and pratique was given."

In regard to invoices of rags, the requirement of the present time is that they shall be accompanied by the certificate of the United States consul at the port of export, or of a physician appointed by him, that the rags were all gathered in a country free from contagious or infectious disease. The affidavit of the shipper, or the attestation of his signature by the consul, will not be considered satisfactory evidence of the healthful condition of rags. The consul must certify of his own knowledge and on his own responsibility as an official.

Swinburne island, six miles down the bay, formerly known as Dix island, is an artificial island between two and three acres in extent. The

hospitals for those sick of infectious diseases (except cases of small-pox, which are removed to North Brother's island, and of diptheria and scarlet-fever, which are removed to the immigrant reception hospital at Castle Garden or to the immigrant hospital on Ward's island) are situated on this island. These were all in good condition, ready for the reception of patients, with ample arrangements for heating and cooking. There is a deficiency, however, in means for flushing the water-closets and buildings generally with sea water; and more water-closets and baths are needed. The dock is in need of repairs, and the foundation of the pavilions (hospital) has become decidedly insecure. The ventilation of the wards is also imperfect. The five pavilions (one story) will accommodate three hundred patients. This hospital is about two miles from the main land, where the dead are taken for burial at Seguin's Point. The transfer in row-boats is tedious and laborious, the landing difficult, and the population hostile. Manifestly, science and humanity combine to demand the erection of a crematory upon the island, as asked for by Dr. Smith, for the disposal of these dangerous remains. From here we steamed, in about twenty minutes, to Hoffman island, farther up the bay. This is also an artificial island, about two acres in extent. The combined action of wind and waves has so seriously undermined its foundation that the day is not distant when the entire structure will collapse, unless prompt and energetic measures are taken to restore it to its original integrity. In many places the interior of the island has sunk considerably below the level of the rip-rap wall which surrounds it. The timbers, piling, planking, and crib-work are in a state of universal decay and dry rot. When it is remembered that decaying wood is one of the favorite niduses of the yellow-fever germ, as proven by the history of the ill-fated "Plymouth," whose decks were not freed from the poison by a three years sojourn in Arctic temperatures, it can be readily understood that such a condition of things is not exactly what the sanitarian would desire for the reception of those bearing that germ and their effects. The president of the New York Board of Health is quite justified in pronouncing "the docks, walls, and grounds to be in such a condition as to call for severe condemnation"—a state of neglect and decay "which is truly lamentable." The quarantine commissioners themselves use even stronger language, declaring that the buildings at the time of the arrival of the Alesia were "in very bad condition, the water and other necessary facilities being very deficient, the property fallen into general decay, and scarcely tenantable for the purposes it was provided for."

The report of the health officer supplies the details on which this general statement is founded. It will not be occupying space unduly to quote his description of the means at his command, and the use made of them, in the effort made to destroy the infection among the Alesia's passengers after their reception in the island. He says,—"It may very properly be asked why these presumably infected families were not isolated from all others? This was not possible on Hoffman island. There was no room for further sub-division. Twenty-five cases of cholera developed among the

immigrants located on this floor." The steam pumps were found to be useless for any purpose; and, although efforts for their repair were continued by night and day, it was not until seven days after the passengers were landed that water was secured for flushing the tanks of the closets of one building; and it was several days later before connections were established which secured sufficient water for sanitary purposes. At no time was the power of the machinery competent to supply the south building with sufficient water or steam heat for the comfort of its occupants. Under these circumstances a bucket brigade (Shades of Stephenson and Watts! a bucket brigade, in a public building of the great Empire state at the end of the nineteenth century!) was immediately organized to bring water from the sea to flush the closets, and from the cistern to supply water for the wash-rooms and bath-tubs. Scavengers, with barrows and shovels, were constantly at work to remove refuse or filth; and it was found necessary to open a latrine at the part of the grounds most remote from the buildings. At intervals, not exceeding two hours, an employé covered the dejections with sand, and saturated this with a solution of bi-chloride of mercury.

After connection with the steam pump and the sea was established, and hose attached to the former, which enabled the whole island to be washed, the latrine was closed; and the sanitary condition of the island speedily became as good as it could be made, *with its imperfect construction and equipment.* The new steam pump, by its connection with the sea, afforded a supply of water which constantly flushed the closets on the upper floor of the north building, and, to some extent, those of the upper floor of the south building.

The morning following the transfer of the passengers from the steamer to Hoffman island, the disinfection of clothing was commenced by the best means then available. The occupants of the lower floor of the north building, for obvious reasons, were selected for the commencement of operations. Underwear was dipped in a solution of bi-chloride of mercury (1 to 500), and other articles were disinfected by the combustion of three pounds of sulphur to 1,000 cubic feet of air space. Immediately after the disinfection of the personal clothing, the baggage was disinfected by exposure to the gas before mentioned. While this disinfection by these methods was in progress, a steam disinfecting tank, which had been built fifteen or more years before at Swinburne Island hospital under the direction of Dr. Bell, then one of the commissioners of quarantine, was removed from the hospital to Hoffman island. This tank was connected with a boiler in the engine-room by means of a perforated pipe which entered by the top, and communicated with the pipe that passed out at the bottom of the tank, but which was closed by a valve on the outside and at the bottom when the steam was introduced, and which, when opened, was an escape pipe for condensed steam. The lid shut into the top of the tank, and was fastened by an iron staple and pin. The resistance of steam pressure was not sufficient to secure speedy penetration of the steam; clothing and baggage were therefore subjected

to exposure of not less than two hours, and such articles as blankets and woollen clothing for three hours.

New mattresses, pillows, and blankets were supplied to the immigrants after they were removed to Hoffman island. The disinfection of the bedding of those on the infected floor was commenced as soon as this steam tank was in place. The clothing of the immigrants on this floor was next disinfected. The evening following the disinfection of the bedding was selected for this purpose. The women and children alone occupied this floor during the time necessary for the disinfection. The following day, the bedding and clothing of class No. 2, and, succeeding that, of class No. 1, were treated in the same way.

Immediately after the passengers were located, an attendant was put in charge of each of the closets. In each, a barrel of a solution of bi-chloride of mercury was placed, with directions. The steam tank used at Hoffman island, in the first instance, was not made for steam under considerable pressure; the steam escaped under pressure much less than that mentioned. To compensate for this imperfection, the contents of the tank were exposed to the steam, as before stated, for two or three hours, at a temperature of never less than 212° F., after a time sufficient to penetrate the articles in the disinfecting tank. A box made of boiler iron, capable of resisting as much steam pressure as an ordinary boiler, with a tube perforated at intervals, which entered the centre of one end and extended nearly through the box, was therefore procured, 7 feet 2 inches in length, and about 5 feet 6 inches in lateral and perpendicular diameter, and weighing 5,000 pounds.

A series of experiments was made with this arrangement, by which it was established that with sixty pounds of steam at the boiler, a pressure of steam was produced in the box, which, in less than half a minute, lifted the safety-valve upon the disinfecting box. A thermometer placed within bundles of clothing, blankets, and mattresses, in these experiments uniformly rose to 230° F. in twelve minutes. During the whole series of experiments made under similar circumstances, there were but two instances in which the instrument indicated less than 230° F.; the lowest of these was 220° F. With the conditions adopted in these experiments for a basis, the bedding, clothing, and baggage of the Alesia's passengers were again disinfected. Linen and cotton fabrics were exposed twenty minutes to this heat, and woollen clothing and blankets thirty minutes.

It is a humiliating fact that the successful treatment of these infected ships and passengers was due, not to timely preparation and generous provision on the part of the great state of New York, but to the charity of the agents of foreign steamship companies, whose timely gift of $3,000 enabled the health officer to supply a few of the most aggravated deficiencies.

PHILADELPHIA.

The quarantine station of this port, known as the Lazaretto, is situated some seven or eight miles below the city on the Delaware river. The

fine old hospitals have ample accommodations for sixty patients, and there is bedding on hand for forty. But no steps have yet been taken to utilize the United States warehouse as an observation depot. The only water-supply is from hand-pumps in wells. There are no water-closets, or sewers, simply old privy vaults. There is no adequate provision for unloading an infected cargo. The disinfecting chamber is a small wooden building about ten feet by twelve, in which sulphur fumigation is practised. There is no apparatus for disinfection by steam. Immediately in front of the station is a wide marsh, into which the establishment drains; and, although it is affirmed that malaria does not exist here, it is manifest that the filling in of this spot, with the erection of a secure bulk-head, preferably of stone, and covering the whole with an impervious coating of asphalt, together with the introduction of a proper system of sewerage, would greatly increase both the salubrity and the commodiousness of the institution.

The plan adopted here of having two officials—one medical, to examine the passengers and crew, the other non-medical, to examine the vessel, bilge, and cargo—appears to your committee judicious, and calculated to diminish the delay to commerce to a minimum.

All the executive officers connected with the quarantine service at this port are appointed by the governor of the state, and their salaries are fixed by legislative acts, although the city is called upon to pay them. They are a health officer, a Lazaretto physician, a port physician, and a quarantine master. The steward derives his appointment from the city board of health. There appears to be an occasional conflict of authority resulting from this arrangement. This service is maintained only during the warmer half of the year. The facilities for heating the hospital are therefore very meagre. During the winter, vessels proceed directly to the city, where they are examined by the port physician, who thus becomes the quarantine medical officer. Small-pox patients are taken from the steamers at the wharf by the ambulance of the municipal hospital, and conveyed through the city to that institution. The interests of a city of nearly a million inhabitants, to say nothing of the many millions of the interior who look to its authorities for protection, demand that equal vigilance should be maintained during every month of the year.

The location of this station cannot but be regarded as unfortunate; and and yet is the only available one for the city of Philadelphia or the state of Pennsylvania. The southern boundary of the state is but twelve miles below, and the river bank for the entire distance is lined with industrial establishments which support an immense population. The property adjoining above is a valuable one for such enterprises, and we were told that negotiations were already pending for its purchase. The Delaware, moreover, is the maritime vestibule of two other states beside Pennsylvania; and expediency as well as justice demands that some system of protection should exist for their bay and river coasts for the seventy miles below the Pennsylvania state line.

BALTIMORE.

This station is about seven miles from the city on the Patapsco river, and is provided with a swift and substantial steamer. The old quarantine grounds, about three miles from the city, contain one hundred and thirty acres of land, on which are a number of old barracks now falling to decay. This has of late been used as a small-pox hospital for the city, but is now under quarantine supervision, and could be utilized as an observation depot in case of urgency, with accommodation for about five hundred if the buildings were repaired.

The station proper is at Little Hawkins or Leading Point, and consists of eighteen acres of land, not walled or securely fenced in. The nearest farm-house is half a mile distant. Escape from the grounds and communication with the outside world would seem to be easy. The grounds are well kept. The hospital, with beds for fifty, is in perfect order, well heated and ventilated, with ample water-closet accommodations on both floors, hot and cold water, and admirable bath-rooms. Each bath-tub is placed in the middle of the room, thus making it possible to support the patient on both sides while placing him in it, and removing him. The plan should be adopted in every hospital. There is an elevator for the patients. The water is pure, and the supply abundant. The drainage is carried to the river by properly constructed sewers.

Scarlet-fever, measles, and diphtheria are quarantined as strictly as small-pox; and the cases are taken charge of by the emigrant commission. All passengers who cannot show a certificate of vaccination, and, if adults, of re-vaccination, are vaccinated.

The clothing and bedding used in the infectious cases are burned, as is also the bedding of all immigrants. No small-pox corpse is allowed to be removed. There are no special arrangements for disinfection ashore. On shipboard the cabin and forecastle are sprayed with a bichloride solution, while in the hold sulphur fumigation is depended on. Free ventilation of clothing and personal effects is insisted on.

Rags from an infected port are not admitted under any circumstances. A vessel from an infected port, with no sickness on board and the length of whose voyage has exceeded the period of incubation of the disease then existing, is detained forty-eight hours under observation. In the event of having a large number of suspects to care for, tents would probably be used. If it were necessary to unload a cargo, it would be done on lighters. There is no contingent fund at the disposal of the commissioner.

On the whole, it must be said that all the existing appointments of this station are well conceived and in admirable repair, and the relations of its head to the municipality, so far as pecuniary support is concerned, all that could be desired. It must be pronounced defective, however, in having no modern arrangements for disinfection, either ashore or aboard, for detaining suspects under observation, or for taking care of an infected cargo, or the cargo of an infected ship.

NORFOLK, VIRGINIA—QUARANTINE DISTRICT OF THE ELIZABETH RIVER.

This board is composed of seven members, three of whom are appointed by the councils of Norfolk, three by the councils of Portsmouth, and one by the judge of Norfolk county.

It must contain two physicians,—one a resident of Norfolk and one of Portsmouth. Their term of service is four years, and they may be reappointed.

The city of Norfolk pays three sevenths of the expenses of the station, the city of Portsmouth three sevenths, and the county of Norfolk the remaining seventh.

The quarantine commissioners have all the powers of the councils of the two cities.

The only boat at the command of the medical officer is a small rowboat, and the water at the anchorage is often extremely rough. While visiting a vessel during a storm last spring, the boat foundered, and Dr. Thom, the health officer, was obliged to swim ashore, narrowly escaping with his life. Vessels enter this port from two directions,—by the mouth of the river from Hampton Roads, and via the Albemarle and Chesapeake Canal, those coming in the latter way being principally small coasters. The boarding station for the former is about four miles from the city, in the light of Craney island, off Lambert's or Sewell's Point. This is also the anchorage for coaling-vessels, being directly opposite the terminus of an important railroad, which, though now used principally for coal, will at no distant day bring other merchandise, and eventually passengers as well. It may therefore properly be said to be directly in the track of commerce.

There is no landing or boarding station and no hospital. The floating hospital, which once existed here, went to pieces three years ago. An infected ship could only be treated with the passengers, crew, and cargo aboard. One requiring any more thorough treatment would be sent to the United States quarantine station at Fisherman's island, Cape Charles. What ample provision for her reception at that point this great republic has made will be seen further on. Vessels arriving from the southward by the canals are ordered to await inspection at or near Johnston's mill, about a mile and a half above the Navy Yard, in what is known as the Southern branch. In point of fact, not needing pilots, they often slip by.

Infected clothing and bedding are burned. The disinfectants used in the vessel are sulphurous acid fumes, and chlorine evolved by the action of sulphuric acid on chloride of sodium. Quarantine is in force all the year round for European vessels, and from May 1st to November 1st for vessels hailing from southward of the latitude of Cape Lookout.

Clean vessels from infected ports are detained ten days, and then fumigated, the process occupying from twenty-four to seventy-two hours. Vessels with contagious diseases on board are detained until the period of incubation has elapsed, after the recovery of the last case. This is

rated at about fourteen days for small-pox and cholera, and twenty-one for yellow-fever. Yellow-fever suspects would on no account be allowed to land or to go elsewhere. Immigrants never arrive here.

THE UNITED STATES CAPE CHARLES QUARANTINE STATION ON FISHERMAN'S ISLAND,

is at the mouth of the bay, off Cape Charles. The "Woodworth" is at present the only boat at the station. It is too small for the heavy seas it is obliged to encounter, old, and slow, so that many vessels run by, unexamined. The boarding station is an anchorage in the open bay, off Trimble Light, about sixteen miles from Norfolk. Vessels are examined here from April 29th to November 1st. The quarantine does not exist in winter. "Fisherman's island" is about thirty-five miles from Norfolk. There is no landing station. The tug anchors about a third of a mile off shore, and passengers are carried ashore on the shoulders of the crew.

The island is a long, barren reach of sand, perhaps a mile in length and a quarter of a mile broad, much of the surface below the level of the ocean. The hospital, now four years old, is rapidly becoming untenantable. The sky can be seen through the roof of the wards, and the foundations are in danger of giving way, as the ocean breaks in during heavy storms, and has washed a deep trench along one side of the building. The keeper, Captain William Walker, who resides all the year round on the island with his wife and assistant, has been compelled, by the encroachments of the ocean, to vacate his own house, and appropriate a part of the hospital as his residence. There is a more elevated plateau farther south on the island, whither the buildings will evidently have to be transferred if the station is continued. A pump, which was depended on for water, is now entirely submerged at high tide. A tank, containing three hundred gallons of rain-water, is the sole water-supply. The dimensions of the building are seventy-five by thirty-eight feet. Ten patients might be very imperfectly cared for here, there being two wards with ten beds. There are, as said, no wharves or piers, no barracks for observation, no warehouses for cargoes. An empty vessel might be disinfected here, but the infected cargo of an infected vessel would have to be removed on lighters hired for the occasion. There is no apparatus of any kind for disinfection. The station is well out of the track of commerce, and has ample anchorage; and the rapid spread of population in the direction of the old station at Willoughby's Sandspit, a few miles below Norfolk, seems to make this the most available point for the protection of all the cities lying above.

The new line of railroad for Fortress Monroe and Old Point Comfort has its terminus on Cape Charles only a few miles distant, and would form a ready means of transportation for supplies. When it is remembered that this station constitutes the sole defence for the cities of Richmond, Yorktown, Annapolis with its hundreds of naval cadets, Alexandria, and the capital of the nation itself, the folly of leaving it thus unequipped is manifest.

WILMINGTON, N. C.

This station is located at Southport (formerly Smithville) near the mouth of Cape Fear river, twenty-five miles from Wilmington.

The organization of the State Board of Health of North Carolina is unique. The nine members are elected by the state medical society, and, with the exception of the civil engineer and the chemist, must all be physicians. This plan gives a guaranty of exceptionally good appointments, and entirely removes the board from the sphere of political influences. The quarantine commissioners are three in number,—a medical quarantine officer under the title of quarantine physician, and two physicians selected by the president of the state board of health. All hold their appointments virtually for life.

Two miles above Southport is passed the quarantine property, about two acres in extent, on which are the ruins of a hospital burned some five years ago. The means of communication with vessels is a row-boat with a crew of four. The anchorage opposite Deepwater Point has ample depth of water, but is exposed to heavy seas, being almost directly open to the sea. A much safer point would be on the opposite side of the river, where the United States government already has a good wharf.

There being no buildings of any kind, it would be necessary to treat the sick on board. The cargo would be lightered, but in the absence oı a wharf a light vessel would run the danger of capsizing in the heavy gales which prevail here. Pumping the bilge, sulphur fumigation, and washing with bi-chloride solution constitute the sole means of disinfection. The safety of the port consists in the fact that no immigrant or other passenger ships enter it.

The period of detention of a vessel from an infected port is rarely over nine days. Each case is treated on its merits. The refuge at Sapelo is so distant as to make it practically valueless for this port. The state legislature turns a deaf ear to all importunities for an appropriation for rebuilding the hospital and furnishing the necessary modern appliances.

It is evident to the most superficial observer that the commerce of Wilmington, and with it the necessity for increased quarantine facilities, must increase rapidly in the near future. This port is in fact nearer at once to the great North-west, and to the West Indies and South America, than any other harbor on the coast. The connecting link, the Cape Fear & Yadkin Valley Railroad, will soon be completed.

The Atlantic coast line puts it in close connection with all the great cities of the North and South, while the Carolina Central brings the interior of the state to its very doors. Add to this the fact that the Cape Fear river is navigable for ships of the largest size, and it must be granted that it is destined to be one of the most important commercial points on the South Atlantic coast. But with the present arrangements, efficient quarantine would necessarily amount almost to an embargo.

The evils resulting from the present disjointed system of quarantine may be thus summed up, in view of the facts just rehearsed:

1. Want of uniformity in quarantine regulations, placing one port at a disadvantage as compared with another.

2. Conflict of authority, owing to the methods of appointing officials.

3. The entire lack of appreciation on the part of local legislatures, whether state or municipal, of the importance of the expenditure of considerable amounts of money in order to render quarantines at once efficient and inoppressive.

4. The tendency on the part of local civic sanitary authorities to limit their responsibility to the protection of their own city, reckless of the consequences which may ensue to inland communities, if they permit infection, which circumstances render harmless to themselves, to pass unchallenged to the latter.

XIII.

THE LOUISIANA QUARANTINE SYSTEM AND ITS CONTEMPLATED IMPROVEMENT.

By LUCIEN F. SALOMON, M. D., Secretary Lousiana State Board of Health.

In treating of this subject it is not necessary to enter into a description of the quarantine system of Louisiana as it now exists, as this is all embraced in the admirable descriptive paper read by Dr. Joseph Holt at the last meeting of this Association. With the new plan of cleansing and fumigating ships and the disinfection of baggage and ships' effects by moist heat, you are all, therefore, sufficiently familiar; but before entering into a description of the needed improvements which are now in course of construction, I desire to call your attention to the results of the present methods, as a guaranty that the opening of the next quarantine season will find the Louisiana health authorities in a position to assure the utmost degree of protection against the importation of disease into the country by way of the Mississippi river and New Orleans. That New Orleans has escaped a visitation of yellow-fever, when the disease has been widespread in the south-eastern corner of the country, has, in my opinion, been largely due to our quarantine, even with its defects, which will be pointed out.

In his last report to the general assembly of Louisiana, Dr. Joseph Holt, as president of the state board of health, wrote as follows:

"Notwithstanding the frequent arrival in quarantine of vessels infected with yellow-fever, and deaths of patients there during the three years of operation of the new system opening the Mississippi to trade, no vessel with its passengers and crew has yet developed a sign of infection after the disinfectant treatment, accomplished immediately upon arrival."

The same can be said of the working of the system during the present year, thus making four years of successful operation. During the years 1885, 1886, 1887, and up to November 1, 1888, of over four thousand vessels arriving at the Mississippi quarantine, there were nine hundred and sixty-six from known infected and suspected ports, distributed as follows:

1885,	210
1886,	234
1887,	309
1888, to November 1,	213
Total, 4 years,	966

of which sixteen were infected with yellow-fever.

A brief resumé of these vessels may be interesting.

June 13, 1885, the bark "Sophie Gorbitz," from Rio de Janeiro, arrived at quarantine, having lost one man from yellow-fever during the voyage.

August 15, 1886, the bark "Scotia," from Colon, arrived, with one case of yellow-fever on board.

September 24, 1886, the bark "Montreal," from Colon, arrived, with one case of yellow-fever on board, and having lost several men during the voyage.

October 17, 1886, the bark "M. & E. Cox" arrived from Colon, having lost three men at that port with yellow-fever.

October 15, 1886, the bark "Tivoli" arrived, having lost three men at sea.

October 20, 1886, the bark "City of Ottawa" arrived from Colon, having had sickness of a suspicious nature during the voyage.

July 6, 1887, the steamship "City of Dallas" arrived from Belize, Honduras, with one case of yellow-fever on board.

July 12, 1887, the steamship "Inventor," from Colon and Belize, arrived, with three cases of yellow-fever, and having lost one man on the voyage.

October 20, 1887, the steamship "Altmore," from Colon, arrived, with two cases of yellow-fever, and having lost one man while at sea.

October 20, 1887, the steamship "Red Sea," from Colon, arrived, with one case of yellow-fever on board.

October 25, 1887, the brig "Sevilla," from Havana, arrived, having had one man sick with yellow-fever while at that port.

August 14, 1888, the steamship "Foxhall," from Port Limon, Nicaraugua, arrived, with one case of yellow-fever.

June 16, 1888, the ship "Marcelino Jane," from Havana, with one case of yellow-fever.

August 13, 1888, the steamship "American" arrived from Havana, having had yellow-fever on board while at that port.

August 8, 1888, the bark "Barcelona," and on August 16, 1888, the steamship "Guadalquiver," from Havana, having had yellow-fever while at that port.

None of these vessels were detained more than ten days after disinfection, and in all the fumigation was repeated five days after the first treatment.

They were all placed in quarantine immediately upon their arrival, the sick removed to the hospital, and the vessels thoroughly cleansed, disinfected, and fumigated, and all ship's effects, baggage, etc., treated by moist heat; and in not a single instance did another case appear after the disinfection, although quite a large number of unacclimated persons were on board at time of arrival.

This was notably so in the case of the steamship "City of Dallas." The man was taken sick after the vessel had left Belize, where yellow-fever was prevailing at the time, and was in the third day of illness when

he arrived at quarantine; and although there were twenty-seven other passengers, most of whom had never before been exposed to yellow-fever, not one of these was afterwards affected with the disease.

Out of the 950 other vessels from infected and suspected ports, it is reasonable to suppose that some few at least would have brought infection into New Orleans had it not been for the efficacy of our quarantine system.

Having thus sketched the results of our work for the past four years, it will now be in order to take up the report of Assistant Surgeon J. J. Kinyoun, U. S. Marine Hospital Service, who was detailed by that bureau for the purpose of testing the efficiency of the methods of disinfection employed at the Mississippi quarantine. Dr. Kinyoun prefaces his report by saying,—"The principles of the methods of disinfection are correct, but faulty in their application:" and while at the time of the visit of Dr. K. the new system may be said to have been still in its experimental stage, it required just such experimentation to demonstrate whatever loopholes existed whereby disease might escape through our quarantine. Although the results of the methods employed have so far been entirely satisfactory *practically*, yet the minute and careful work of the investigator has led to the present contemplated changes.

But first let us see wherein the defect lies. Is it in the application of the sulphur dioxide in the hold of the vessel, or in the method of heat application, or in both? We shall first consider the experiments in testing the application of moist heat, and quote from Dr. Kinyoun's report:

EXPERIMENT No. I.—Cultivation tubes of peptone agar-agar inoculated with,—
Spirillum choleræ Asiaticæ,
Bacillus anthracis,
Bacillus typhi abdominalis,
Bacillus coli communis,
Bacterium of yellow-fever (?),
were placed in a wire basket and hung in compartment No. 8, panel No. 39, the one most distant from the boiler, and upon which but little clothing was hung. In 16 minutes the temperature (dry heat) reached 79.4° C., when steam was turned on and kept 20 minutes. Cultivations removed and inoculations made therefrom. . . . Repeated examinations show all growths to have been killed.

EXPERIMENT No. V.—Chamber well charged with goods. A series of cultivation-tubes containing rags (both cotton and woollen) that had been inoculated with,—
Bacillus anthracis,
Bacillus typhi abdominalis,
Bacillus pneumoniæ,
Staphylococcus pyogenes albus,
Staphylococcus pyogenes aureus,
were placed in among mattresses and blankets and exposed for 20 minutes to moist heat; temperature indicated, 62.5° C. Examination showed all growths dead save that of anthrax.

EXPERIMENT No. VI.—Clothing and bedding of steamship "Saturnina," from Cuba to New Orleans, placed in heating-chamber; all compartments filled. Owing to the uncleanness of the crew's bedding, we suggested that a longer time be given in the steaming process. Cultivations on agar-agar of,—
Spirillum choleræ Asiaticæ,
Spirillum Finkler-Prior,

Bacillus anthracis,
Bacillus typhi abdominalis,
Bacillus pneumoniæ,
Bacillus coli communis,
Staphylococcus pyogenes albus,
Staphylococcus pyogenes aureus,

were placed in compartment No. 7, panel 34, arranged on mattresses, and surrounded by pillows. Temperature of middle chamber (quarantine thermometer), 76.6° C. Left for 55 minutes; thermometer among cultivations indicated 67°; inoculations show all killed except bacillus coli communis and bacillus anthracis.

EXPERIMENT No. VII.—Chamber was lightly charged, several panels in each compartment being empty. Cultivations made upon rags of the following:

Spirillum choleræ Asiaticæ.
Bacillus typhi abdominalis.
Bacterium yellow-fever.
Staphylococcus pyogenes albus.
Staphylococcus pyogenes aureus.

These were suspended among clothing, chiefly underwear, and allowed to remain 40 minutes. A thermometer placed in a tube containing similar media registered 99°. Inoculations from the tubes show that all have been killed except the bacterium of yellow-fever (?).

These experiments show that, even with the defects which existed, the method of disinfection by steam was efficacious in destroying the majority of cultures experimented upon, while, on the other hand, owing to overcrowding of the chamber with clothing, and lack of proper closure of the panel doors, the temperature did not attain a sufficiently high degree, and consequently failed to destroy the growths, as shown in experiments Nos. 3 and 8 of Dr. Kinyoun's report.

As to this portion of the system of disinfection, the report shows that the application was faulty, owing to a want of proper and uniform distribution of heat throughout the chamber, owing to crowding, and escape of heat through the imperfectly fitting doors, size of chamber, and absence of means of obtaining complete imprisonment of the steam.

We propose to overcome the present faultiness of the system as follows:

The quarantine station will be removed to a point nearer the mouth of the river, at a point which is completely isolated, and which, owing to its topography, can be always so maintained. The work of erecting new buildings, at a point just above the head of the passes, has already begun, and the contract requires its completion by March 1, 1889, so that everything will be in readiness for the opening of the quarantine season of next summer.

We have also in course of construction, to be placed in position on the completion of the buildings, three cylindrical iron chambers, as shown in the plans now submitted. Each of these chambers will be constructed of $\frac{3}{16}$ inch steel plates, riveted together, and will be eight (8) feet in diameter and fifty (50) feet long, and containing 2,500 cubic feet of space, with a guaranteed working pressure of 15 pounds to the square inch. They will each be furnished with 120 circular $\frac{1}{2}$ inch heating pipes, and one or two longitudinal 1 inch perforated pipes, for deliver-

ing steam into the chamber. With this arrangement, we shall have 1,080 square feet of heating surface to the 2,500 cubic feet of space, which will be a marked improvement on the present wooden chamber, which has 4,800 cubic feet contents, and 1,462 square feet of heating surface;—or, to show the comparison more definitely, 1 square foot of heating surface to $2\frac{1}{2}$ cubic feet of space in the new chambers, while the proportion is 1 square foot of heating surface to $3\frac{1}{2}$ cubic feet of space in the old chamber, with the additional, and most important, advantage that the old, or present, chamber is not tight; while in the new, which can be tightly sealed, a steam pressure can be obtained, and a consequent equal distribution of heat throughout its interior. The racks upon which the clothing will be hung are suspended upon rails, as shown in the diagrams, and can be pulled out, filled, and then returned to the chamber, which closes by a suspended door, as demonstrated.

As to the practicability of the work, there can be no doubt, and for the purpose of satisfying himself on this point, Dr. C. P. Wilkinson, president of the Louisiana State Board of Health, to whom is due the credit of the present plans, had constructed a miniature chamber, for experimental purposes, and with which most satisfactory results were obtained. It was shown, that with a pressure of 50 pounds in the boiler a dry heat of 230° F. was easily obtained, with an undisturbed pressure of 3 pounds per square inch, regulated at will by a blow-off valve. A moist heat of 250° F. was also readily obtained, with a pressure in the chamber of not more than 7 pounds to the square inch, and this pressure regulated at will by means of the blow-off valve, without materially affecting the temperature.

These experiments warrant the belief that in the new chambers now being constructed a sufficient degree of moist heat, equally distributed, can be obtained, which will be destructive to all disease germs. And surely, in the light of what has been accomplished with the present defective chamber, we are warranted in expecting a greater and more assuring degree of efficacy with the new.

We therefore feel confident that by the coming spring the state of Louisiana will have as perfect a system of disinfection as human ingenuity can at present devise.

Referring again to the report of Dr. Kinyoun, we shall consider the fumigation of vessels by the sulphur dioxide.

The report shows that the effect of the fumigation upon the cultures was not as satisfactory as could be desired, but as textile fabrics are considered the most dangerous disease-bearers, and as all these on board a vessel from an infected port are subjected to the moist heat, we have, therefore, only the vessel's hold and apartments to deal with; and, acting upon the suggestions contained in the report, it is our intention to render the fumigating and cleansing of the vessel more efficacious.

First, the exhaust fan will be set in motion, and a large supply of fresh air thrown into every portion of the vessel, while at the same time the bilge will be pumped out and flooded with the sublimate solution of

the strength of one part to five hundred, after which the sulphur dioxide will be thrown in by the same method in use at present; but larger quantities will be used, at least twice the quantity of sulphur being burned,—say from 200 to 800 pounds, according to the size of the vessel,—and it will be allowed to remain in the vessel, with hatches sealed, from twenty-four to thirty-six hours, or longer if the vessel is infected. In addition, the washing of every available spot in the vessel with bichloride solution will be practised.

With the improvements as herein outlined, the Louisiana State Board of Health trusts to be able to give a reasonable assurance that all vessels coming from infected ports will be made free from danger. And holding, as we do, guard at the entrance to the Mississippi valley, it is hoped that the trust thus naturally imposed upon us will be well and efficiently kept. If, through human agency, infection can be turned away from the Mississippi river, or destroyed at its coming, it is our purpose to leave nothing undone to secure this end.

XIV.

THE CANADIAN SYSTEM OF MARITIME SANITATION.

By Frederick Montizambert, M. D., Edin., F. R. C. S., D. C. L., Medical Superintendent of Quarantine.

Among the topics specially selected by the Executive Committee for consideration at this meeting is that of Maritime Quarantine.

Of the vast tide of immigration setting towards this great Northwest, a considerable portion comes to you by way of the Canadian seaports, and especially by way of the River St. Lawrence.

It seems appropriate, therefore, that at a meeting of this Association, held in this city, some account should be given of the means employed by Canada to protect herself and you from the introduction of infectious diseases from beyond the sea. In endeavoring so to do I propose to speak, first, of the Canadian system of maritime sanitation as a whole, and then to illustrate its working by giving some description of the quarantine station of Grosse Isle—the station which guards and protects the great water-way of the St. Lawrence.

When the various Canadian provinces united to form the Dominion of Canada, and an apportionment was made of subjects of jurisdiction and control to the Federal and Provincial legislative bodies respectively, maritime quarantine was placed in the hands of the Federal, or national, government.

It was recognized, I presume, that to leave it to provincial and local authorities was to risk the possibility of diverse or conflicting regulations, limited possibly by local, commercial, or other interests; that the whole country would thus be helplessly exposed to the possible entry of epidemic disease through any seaport where, for any reason, proper preventive measures were ignored or neglected; that exotic disease was to be considered as a common and national enemy; and that for these and similar reasons it was for the national government to assume the administration of this national subject. In this manner that uniformity is obtained which is essential to efficiency, and authoritative management is secured with the largest liberty for individual interests that is consistent with the public safety.

The Canadian system is one of medical inspection and maritime sanitation. Each of the principal ports of the Dominion has an organized sanitary service competent to deal promptly with all vessels, passengers, and crews. Every vessel arriving at these ports from outside of British North America is subject to inspection by a duly appointed quarantine medical officer, holding appointment from, and directly responsible to,

the Federal government, before being allowed to proceed or to make customs entry. Any vessel from a healthy port that has not touched at an intermediate suspected port, or communicated directly with a suspected vessel, and that has not had any sickness of a suspicious nature during the voyage, is immediately admitted to free pratique when these facts have been duly sworn to by the captain and surgeon of the vessel. Any vessel from an infected or suspected port, or that has had compromising relations or suspicious sickness during the voyage, is subject to a more rigorous medical inspection, when, if no infection is found on board, the vessel and all with her are, as a rule, allowed to proceed. The quarantine officer may, however, if he deem it necessary, detain such a vessel "under quarantine of observation for a period of not more than three days, during which time the passengers and crew thereof shall be subjected to a strict purification" under his direction. But if it be found that infectious disease or sickness of a suspicious nature has existed or does exist on board, the vessel is detained sufficiently long to permit the landing of any sick, and the prompt disinfection, in whole or in part, of the vessel itself and its contents.

These regulations, it will be observed, are, with certain modifications, much on the lines of the system of medical inspection recommended at the International Conference of Vienna.

The great importance of general sanitary measures on the vessel during the voyage also is fully recognized. One paragraph of the Canadian Quarantine Regulations reads as follows: "Every steamship or sailing vessel arriving with infectious disease shall be liable to be detained at the quarantine station for disinfection, together with its cargo and passengers and crew; but every steamship or vessel provided with one isolated hospital for men and another for women, on the upper deck, ventilated from above and not by the door only, may, in the discretion of the quarantine medical officer, if he is furnished with satisfactory evidence that such hospitals have been promptly and intelligently made use of, be allowed to proceed after the landing of the sick, and the disinfection of such hospitals; any vessel, however, arriving with infectious disease, without having such special isolated hospitals, or, having them, without satisfactory evidence that such hospitals have been promptly and intelligently made use of, shall be liable to be detained for disinfection at the quarantine station." And among the questions to be answered under oath to quarantine officers, by masters, surgeons, or officers of vessels, are the following: "Have you an isolated hospital for men and another for women, ventilated from above and not from the passage?" and "Were such hospitals, or one of them, immediately made use of on the occurrence of disease?" The endeavor is thus made to induce vessels to provide themselves with properly isolated and properly ventilated hospitals, and to make intelligent use of them,—the amount of necessary disinfection, and so, of course, the length of the detention of the vessel, in case of sickness, being made to depend in great measure upon whether or no such hospitals have been provided and daily made

use of. There can, of course, be no doubt whatever of the evil of the location of a ship's hospital for infectious diseases in the steerage, or in a cabin opening off a covered alley-way. In such cases too often the only ventilation is through openings from the hospital into the steerage or the alley-way, or by the opening of the hospital's door itself. In this way the infected and disease-laden atmosphere is diffused in concentrated form amongst the masses of immigrants in the steerage, or inhaled by those who go through the passage. This must greatly increase the danger of infection for all on board. These facts are brought sharply under the notice of the owners and agents of vessels by the Canadian Quarantine Regulations. They know that any vessel arriving with even one case of infectious disease on board is liable to be considered infected throughout, if the sick have been kept in such cabins as, from their non-isolation or imperfect ventilation, seem to make it probable that the infection may have spread, and that the disinfection of such a vessel will include the landing of any passengers and of their effects for purification, and the fumigation of the thus emptied vessel,—whilst the privilege of being permitted to proceed at once, after the transfer of the sick to the quarantine steamer and the disinfection of the ship's hospital cabin only, is restricted to vessels having satisfactory hospitals and giving satisfactory evidence of having intelligently and promptly used them. These regulations have had the desired effect of inducing ship-owners to provide suitable isolated and ventilated hospitals on their vessels, and to instruct their surgeons to isolate in them every suspicious or even doubtful case from the very first initial symptom that raises the question or suspicion in the mind, and before it can communicate infection to others, thus placing that great fleet of passenger-carrying steamships in a safer sanitary condition, lessening not only the risk of the diffusion of disease amongst the steerage passengers, but also the danger to cabin passengers of contracting disease from any outbreak during the voyage.

The Canadian system further requires that no steerage passenger shall be allowed to pass the inspection stations without furnishing evidence to the satisfaction of the quarantine medical officer of having been vaccinated within the seven previous years, or having had the small-pox within that period. And full authority is given to the quarantine officers to insist upon vaccination, or a quarantine of observation, in the case of any who may arrive without satisfactory evidence of protection within seven years. This period of seven years obviates difficulties between inspecting officers and ships' surgeons as to whether or no any particular individual is sufficiently protected by a previous vaccination. That the protective influence of vaccination does become diminished or exhausted with the lapse of years there can be no doubt. To leave the determination of this time to the judgment of each medical officer would be to open the door to an infinite diversity of usage, to invite friction between the inspecting officers on the one side and the ship's surgeons and immigrants on the other. And one result would undoubtedly be, that many would

be exempted who would be in some degree susceptible to the contagion of small-pox, and who would, when exposed, develop that disease in a more or less modified or varioloid form. The term of seven years is fairly within the protective period, and it also lends itself to the popular idea that the body is renewed in each seven years, and so commends itself for acceptance by the immigrant. When not accepted, the alternative is the being kept under quarantine of observation until the expiry of the usual average period of incubation of small-pox from the date of the last possible exposure.

But vaccination at the port of arrival is not what is desirable or desired. Owing to the long period of incubation of small-pox—twelve or even fourteen days—this protective work should be done long before. Otherwise, with the present short ocean voyages, the disease, when it has been contracted shortly before sailing, may pass the most efficient quarantine inspection in the latent condition of this period of incubation, being in such cases possibly too far advanced in that period to be within the controlling influence of the so late vaccination at quarantine. The Canadian regulations are framed to endeavor to secure vaccination on shipboard. And this vaccination on shipboard can only be depended upon to prevent the development of small-pox from the reception of its infection previous to embarkation, when it is performed during the first day or two of the voyage, so that the complete development of the vaccine vesicle, with its areola and "index of safety," may be secured before the termination of the period of incubation of small-pox, and so the attack of that disease may be averted.

This, then, is the rule and the usage on all ordinary occasions. But should a case or cases of small-pox have occurred on any incoming vessel, the regulation as to vaccination also applies to everybody on board, —crew, cabin passengers, and all.

This brings me to the subject of the vaccinal protection of cabin passengers. In the Quarantine Regulations of Canada for the year 1886 the vaccinal protection of cabin passengers, as well as all others, was required at her seaports. At the meeting of this Association, held in Toronto in October of that year, a resolution was adopted, on a motion by Dr. Rauch, of Illinois, recommending the extension to all American ports of this requirement. But this recommendation has, unfortunately, not as yet led to any action being taken by them in this matter. The objection has been raised, that there is already much trouble with cabin passengers when they have to be vaccinated, where small-pox has occurred on the voyage; and that that trouble would only be intensified and multiplied by extending the requirement to cabin passengers by every vessel. It seems to me, however, that it is the very usage that now obtains that causes the difficulties. The general adoption of the rule would, I hold, remove them altogether. People coming to this country now, either do not think of it at all, or understand that, as a general thing, no questions are asked of cabin passengers, and so they take no special precautions. In most instances no trouble ensues. But every now and then a

case of small-pox occurs on the voyage, perhaps among the numerous steerage passengers. And then on arrival at the inspection station the cabin passengers, ladies and all, find themselves suddenly and unexpectedly confronted with the requirement that they must show their arms to, and possibly submit to vaccination by, a ship's surgeon or a quarantine officer, about whom they know nothing, and in whom and in the purity of whose vaccine they may have no confidence. Hence, very naturally, a great deal of trouble, vexation, and opposition. For this is unquestionably an intolerable annoyance to which to subject persons of that class. But if New York and the New England maritime states and cities would join with Canada in action in this matter, these troubles, instead of increasing, would entirely cease to occur. Let it once be generally known that all passengers, cabin as well as other, would be required to furnish evidence of recent vaccination before being allowed to land at any port on this side, then first-class passengers going from here for a trip to Europe, and those coming from Europe here, would, before leaving their homes, send for their family physician, be vaccinated by him, if need be, and in any case provide themselves with vaccination certificates. This they would do as regularly and as much a matter of course as they would provide themselves with steamship tickets, or with passports, if about to travel where they are exacted. The steamship ticket agents could remind those purchasing tickets, or otherwise taking their passages, of this requirement. On the voyage the ship's surgeon could quietly satisfy himself that all the cabin passengers possessed satisfactory certificates, and would certify that fact under oath to the quarantine officer at the port of arrival. And so cabin passengers would be saved from annoyance, without risk to the public health, even if small-pox occurred on the voyage, and the distressing scenes unavoidable under the present usage would entirely cease to recur. Moreover, the objection I have cited seems to imply that the object sought is the vaccination of passengers at the port of arrival, whereas, as I have said already, the practical result aimed at by all these vaccination regulations is to secure the vaccinal protection of those coming to our shores, if possible before they embark, or, failing that, as early as possible on the voyage.

Canada, however, has had to withdraw, for the present, at any rate, the regulation requiring the vaccinal protection of cabin passengers. She cannot gain anything by acting alone in this matter. If Portland, Boston, and New York will not join her, action on her part alone would simply divert first-class travel into Canada via one of those ports instead of via the St. Lawrence. She is not an island, protected all around by maritime quarantines. Cabin passengers would still come to her vaccinally unprotected. The only difference would be that they would enter Canada over the frontier a few hours later. It is manifest that it would not be justifiable to keep up a differential regulation in the St. Lawrence, to the injury of the Canadian steamship lines, if the sanitary protection of the country is not to be secured by it.

Judging by the past, however, it may fairly be assumed that Canada

will be prepared again to require at her seaports the vaccinal protection of all incoming passengers of whatever class, just so soon as New York, Boston, and Portland will join her in conformity of enactment and enforcement in this important matter.

In addition to the quarantine station in the St. Lawrence, the other organized quarantine ports of the Dominion are Halifax and Pictou and Hawkesbury, and Sydney, Cape Breton in the Province of Nova Scotia, St. John and Miramichi in the Province of New Brunswick, Charlottetown in the Province of Prince Edward Island, and Victoria in the Province of British Columbia. There is also an inspecting quarantine officer at Rimouski, in the St. Lawrence, where the incoming European mails, and occasionally a few passengers, are landed to be brought on by train.

The Pacific coast quarantine is assuming a new importance, not only for the Dominion of Canada, but for the whole continent, since the opening of a transcontinental railway line by the Canadian Pacific, and the establishing and growing importance of direct steam communication between China and Japan, and the terminus in British Columbia of the Canadian Pacific Railway.

To all these organized quarantine ports the rules and regulations are made so far as possible to apply. They are for the most part supplied with wharves, boats, hospitals, buildings, and other requirements necessary for the reception of passengers, their separation in categories, the attendance upon the sick, and the keeping of the suspected under quarantine of observation.

It would, of course, be quite impossible to furnish every seaport of the Dominion with an establishment so fitted; but those seaports not provided with a regular quarantine are not, nevertheless, left unprotected. The collector of customs of each port in Canada is made *ex officio* a quarantine officer, empowered to detain vessels at safe distance from the shore, to summon medical help and advice, to take, under direction of the Federal government, such measures as may become necessary, should a vessel infected with disease, or coming from an infected port, make her appearance. It is also within that officer's power to order such vessel to the nearest quarantine, if such action be deemed to be requisite.

No fees or charges of any kind are payable in Canada by vessels at, or for, quarantine. The quarantine officials are all salaried officers, and the taking of any fee or emolument from vessels or persons in quarantine is strictly forbidden by law. The maintenance of any passengers who may be detained under quarantine of observation falls, of course, upon the vessel as a part of the voyage. But all the expenses of the quarantine establishments, of the medical inspection and the disinfection of vessels, and of the care, maintenance, and treatment of the sick in quarantine, are defrayed by the Federal government.

The Canadian system is, then, one of medical inspection; of the vaccinal protection of steerage passengers in every case, and of all on board when small-pox has occurred; of segregation of the sick from the well; of the prompt disinfection of the ship's isolated hospital; in more

serious cases, of further removal of the vessel out of the track of commerce and the necessary disinfection, by the germicide agents most to be depended upon for prompt and certain action; of the vessel and of all infected "material;" and in all cases the release of the vessel, passengers, crew, and cargo, so soon as they have been rendered safe and free from the danger of communicating disease.

This is very different from the old "time" quarantine—the routine of detention. It is a system of maritime sanitation, such as has been well described as a "common-sense" quarantine, which aims to prevent the introduction and extension of infection not by merely arresting it at a given point, and there leaving sick and well at its mercy, until, the susceptible material having become exhausted, no more cases of the given disease occur; but by removing the susceptible at once from its influence, and then destroying it and the conditions necessary for its existence by scientific methods of purification and disinfection.

The quarantine station of Grosse Isle protects and safeguards from the introduction of infectious disease the water-way of the River St. Lawrence. By that great entrance-gate a large immigration arrives each year for distribution not only throughout Canada, but also to your northern and north-western states and territories.

Recognizing this, the states of Illinois and Minnesota have recently sent the executive officers of their state boards of health to inspect that station; to see how and to what extent it is adapted and fitted to protect Canada, and, in protecting Canada, those great states which lie near to her, and to which, in part, this stream of westward immigration and travel flows.

The station consists of an island in the St. Lawrence about thirty-one miles below Quebec. It was selected for quarantine purposes at the time of the first advent of cholera to this continent, in 1832. It lies in the stream about four miles and a half from the south shore of the river, about six miles from the north shore, and two miles or more from the fairway or channel along which incoming and outgoing vessels pass.

No one is allowed to reside on the island except the employés and their families. A written permit from the officer in charge is required before any one can either land upon the island, depart from it, or, when infectious disease is present, pass from one of its divisions to another.

Its position and capabilities of isolation are, therefore, exceptionally good, and are, indeed, all that can be desired.

The island is a well wooded one, between two and three miles long. It is divided into sick, central, and healthy divisions.

In the sick division, at the eastern extremity of the island, are the hospitals, and quarters of the hospital staff. There is a two-story brick hospital, with one hundred beds, including some in private wards for cabin passengers, ship's officers, etc., and a detached one-story wooden shed, with four separate wards and about seventy beds, for cholera or small-pox patients. There are also ample facilities provided for the washing, disinfection, and fumigation of bedding, clothing, etc.

In the central division are the residences of the inspecting officers and of the crew of the inspecting steamer. This division is kept so far as possible free from all infection, as from it the inspecting staff go out to meet incoming vessels. In this division, also, the churches and chaplains' residences are placed.

In the healthy division, at the western extremity of the island, are the houses of detention for suspected passengers from infected vessels. These detention houses are eight in number, grouped in twos and threes, and furnish in all accommodation for about two thousand persons. In this division, also, there is a large wash-house with twenty-four furnaces and boilers; a bakery; and an oven for hot-air disinfection; a fumigating room; police barracks, etc. This division is separated by more than a mile of generally wooded land from the sick division and the hospitals.

There is telephonic communication between the different divisions of the station, and telegraphic communication with the main land. Incoming vessels requiring inspection are met in the offing, and inspected immediately upon their arrival, whether by day or by night. The position of the station is marked at night to vessels arriving, and the working of the night service is facilitated by the presence of an illuminated gas-buoy about two miles out from and opposite to the station.

For the inspection service two small steamers are maintained. The larger of the two, the "Challenger," being the regular inspecting steamer, on duty with steam up night and day, always in readiness to meet incoming vessels in the offing. She is provided with a hospital cabin, with beds, etc., for the landing of the sick, and with disinfecting appliances, consisting of a force-pump and drench for the mercuric chloride solution, and fire-hose, etc., for superheated steam.

When infectious disease is found to have occurred on any incoming vessel, and to have been satisfactorily isolated, the sick, with the attendants and all the contents of the ship's hospital, are at once transferred to the quarantine steamer. The emptied hospital of the ship is then drenched with mercuric chloride solution 1 to 700, and then treated with superheated steam, a self-registering thermometer being hung up in it, and the attainment and maintenance for a few minutes of a temperature of 230° F. being considered sufficient. The vessel meanwhile proceeds up the river with the quarantine steamer alongside, so that the delay is reduced to the minimum.

The other little steamer, the "Hygeia," is used as a supply-boat and mail-boat, as a means of taking convalescents up to Quebec when discharged from quarantine, and as a reserve inspecting steamer in case she is so required. She is also used for the longer process of disinfection, where, from the non-isolation or general diffusion of disease, the whole of a vessel requires purification. To this end she has on board, in addition to the same appliances as the "Challenger," the furnaces, exhaust-fan, tubing, etc., for fumigating with the sulphur dioxide blast, as introduced by Dr. Joseph Holt, late president of the State Board of Health of Louisiana, at the New Orleans quarantine. When the sea is running

high, however, much practical difficulty is experienced in the working of this process from the quarantine steamer, owing to her pitching and rolling alongside of the larger vessel. The expediency of extending the quarantine wharf into deep water, so as to allow infected steamships to come to it for the immediate landing of passengers, etc., and the disinfection of the emptied vessel, is now under the consideration of the government. If this extension be effected, the sulphur blast will be transferred to the wharf, which will also be fitted up with all other modern appliances for prompt and effective disinfection, with rooms for the temporary reception of patients landed at night, etc.

A sum of money has already been granted by parliament for appliances for the disinfection of passengers' clothing and effects by superheated steam, either in a Troy laundry superheating chamber, or such other apparatus as may be decided upon as best calculated to secure its germicidal action. And such appliances will be erected early next spring.

The general routine of inspection, with the questions to be answered under oath by the captain and surgeon of each vessel, and the vaccinal protection of immigrants, are those I have already referred to. No vessel from outside of British North America can enter at the custom-house at Quebec or Montreal without producing a quarantine clearance. So that the people of Canada and of this great Northwest have the assurance that no vessel from abroad can send immigrants among them from that route without satisfactory evidence of their harmlessness having first been given to a medical officer directly responsible to the government.

From this account of the general system and its practical working at one of the stations, it will be seen that the Dominion of Canada is keenly alive to the importance of maritime quarantine; and that she is certainly not behindhand, to say the least, in her efforts to safeguard the general health and to protect herself and her neighbors from the inroads of disease.

XV.

HISTORY OF QUARANTINE IN THE STATE OF TEXAS FROM 1878 TO 1888.

By ROBERT RUTHERFORD, M. D., State Health Officer.
Houston, Texas.

As a premise to this matter, my desire is to call the attention of the people at large to the facts existing prior to those years. In doing this, I desire that the fact may be pertinently shown that quarantine has been the only prophylaxis against infectious diseases that we have enjoyed. In support of this fact I will call over the non-quarantine years, and show the number of years of prevalent fever in comparison with those that have occurred since.

In 1837 fever was imported into Texas; 1838 it prevailed; 1839 it was fearful; 1840, not noticeable; 1841, the same; in 1842, the same; 1843 it increased; 1844 it was again epidemic; 1845 it was bad; 1846, not prevalent; 1847 it reappeared; 1848 there was fever; 1849, fever; 1850, doubtful conditions; 1851, doubtful; 1852, none; 1853, a plague; 1854, bad. It was in this year that the first quarantine was established in Texas, which was done by the little town of Matagorda, a quarantine boat being stationed at Dog Island channel in Matagorda bay, protecting the place from communication with Port Lavaca, Indianola, and Galveston, where the fever was prevailing. In 1855 the fever was again bad; 1856, none; 1857, again prevalent; in 1858 and 1859, the same; in 1860, 1861, 1862, and 1863, no fever; in 1864 a blockade runner brought the fever to Galveston, and it reached Houston; in 1865, no fever, and 1866, no fever; 1867 a terrible scourge visited Texas, and the last that she has had of great consequence. Its first appearance was at Indianola. During the latter part of July a schooner came into that port from Vera Cruz; the woollen blankets on board of her were spread to dry, and in two days the fever made its appearance. In August it reached Galveston; and about September 3, Major Johnson died at the Hutchins House in Houston, his being the first case in that place. The fever extended this season to every town and hamlet where there was quick transportation, and only ceased in January, 1868. Dr. R. K. Smith, of Galveston, was health officer at that place this year, but was removed by General Griffin then in command, and an army officer, Dr. Brown, appointed, who served during the military rule. In 1868 fever did not prevail; 1869 there was little in Galveston; and in 1870, no fever. That season the local board of health at Galveston placed a quarantine against New Orleans, the first quarantine instituted since

that mentioned at Matagorda in 1854. The effect produced on the public mind, that benefit was derived by Galveston from her action against New Orleans, induced other communities, among which was Houston, to believe that there was virtue in this mode of protection. In 1871 there was no fever; 1872, a few cases. This year Dr. Geo. W. Peete was appointed health and quarantine physician by the municipal authorities of Galveston. In 1873, when the fever again appeared in New Orleans, and Galveston failed to take her usual precaution of the two preceding years, Houston, in her turn, by her municipal council acting as her health authorities, on this occasion placed a quarantine against Galveston and New Orleans. In this year commenced the first of practically organized quarantines in Texas. The temporary quarantines that had existed between localities took more the shape of local commercial interest than the true idea of the protection to be obtained by the communities at large from them,—as, for instance, this one of 1873 against Galveston, which lasted for ten days, and was abandoned under a scandal. In this year the fever was epidemic at Calvert and Columbus, two interior towns on different railroad lines. In 1874 there was no fever; in 1875, none; but the coast was visited by a terrific cyclone, accompanied with great loss of life and property. Dr. Geo. W. Peete, who was at the quarantine station on the east end of Galveston island, was swept away and lost during the gale, September 16. Dr. W. F. Blunt, his son-in-law, succeeded him on October 4 the same year. In 1876 fever was epidemic in Marshall; in 1877 no fever. In 1878 the crisis really came by the appearance of yellow-fever in New Orleans; the result has since been always considered the test of the efficacy of quarantine. Quarantine was declared in July by Galveston against the city of New Orleans. Railroad communication having been completed between New Orleans and Houston, her authorities took advantage of the circumstances of her danger, and placed a quarantine against New Orleans also. Like all actions of this sort it spread like wildfire, and passed up the Central Railroad in the shape of an alarm, as the fever had done in 1867. Brenham quarantined against Houston, Hempstead against Brenham, Bryan quarantined against Millican, and so on through the catalogue, each individual municipality acting under its own jurisdiction, countenanced by the only law then extant, the law of 1859, which was simply a law of permission, and allowed communities to protect themselves from one another and from plagues that existed outside. This nature of affairs, each little municipality acting in its own individual capacity, brought about a convention of health officers, which took place in the city of Houston on September 19, 1878. This convention was called upon the following letter:

BRENHAM, September 5, 1878.

DR. R. RUTHERFORD, *Health Officer of the City of Houston:*

It has occurred to me that great good would result from a conference of the health officers throughout the state. With a view of perfecting a joint system of quarantine regulations by concert of action throughout the state, vigorous precautionary measures can

be insured and enforced with the least possible expense and public inconvenience; valuable suggestions as to a quarantine system would be made in a general conference in which the full matter was discussed. Occupying a central position as you do, you seem to be the most proper person to issue the call. Houston is the most convenient point for the meeting, for it is accessible to all the important towns in the state on the lines of our railroads. I suggest that you at once call, by telegram, for as early a day as possible. I shall take great pleasure in attending, and I do not doubt the interests of our state will be greatly promoted by our action.

Yours truly,

(Signed) J. M. ROSS, M. D.

Upon this request of Dr. Ross I issued a call, and on September 19 there convened at Houston the following representatives of different towns: to wit, Dr. H. J. Hunter, health officer of Palestine; Dr. A. P. Brown, president of the board of health of Jefferson; Dr. M. Matkin Hearne; Dr. J. A. Allen, Consicana; Dr. F. E. Hughes, Dallas; Dr. J. L. Cunningham, Hempstead; Dr. R. H. Harrison, health officer of Columbus and Colorado counties; Dr. J. H. White, Walker county; Dr. R. Rutherford, health officer, Houston; Dr. R. H. L. Bibb, health officer, Austin; Dr. W. B. Powell, health officer, Matagorda county; Dr. J. M. Hayden, member board of health at Galveston; Drs. T. J. Heard and Clark Campbell, Galveston; Messrs. J. K. Wiley, Walker county, and R. D. Gribble, Jefferson, members of boards of health. Telegrams and letters were received from the following gentlemen, expressing inability to attend, but acquiescence in any general arrangement agreed upon: Dr. J. M. Ross, of Brenham; John B. Smith, health officer, Crockett, and Dr. D. C. Hewson, president board of health of Orange.

Dr. Harrison was appointed chairman, and Dr. Bibb, of Austin, secretary. The chairman stated that the object of the convention was to establish community of action in quarantine matters, and to discuss the expense the state now undergoes for sanitary protection. The suggestion of the appointment of agents, one for each county on the frontier, to lessen the burden sustained by individual counties in the maintenance of separate county quarantine, was made.

Therefore the following resolution was adopted, the same having been reported by a committee of five composed of Drs. Matkin, Hughes, Hayden, Cunningham, and Rutherford:

WHEREAS, Believing in the protection afforded by strict quarantine upon the main transportation lines entering the state, we recommend the following regulations, which will, if adopted by general consent of all contiguous counties and towns along these lines, afford state protection:

First, That there shall be appointed, at Orange, Marshall, Texarkana, and Denison, officers whose salaries shall be conjointly shared by the several counties and towns, and whose duties it shall be to carry out regulations as adopted by this convention.

Second, We believe that these regulations can be better executed by having one executive head at some point upon such lines, and that the quarantine regulations at the city of Houston, September 2, offer sufficient defence, if strictly carried out, with regard to freights, passengers, and mails: provided that nothing in the above rules shall be construed except as recommendatory to local communities, or specially to seaboard towns.

It was "moved by Dr. Hughes, of Dallas, and seconded by Dr. Hayden, of Galveston, that Dr. Rutherford, of Houston, be made the executive head of the state." No other nominations being made, he was unanimously elected.

The following resolution was then offered and passed:

Resolved, That each and every member of this convention shall make a report to their respective health boards and communities, and urge the adoption of the views expressed by this convention.

The convention then adjourned.

As soon as practicable I started on a tour of the border to accomplish, if possible, the work before me. At Jefferson I was met by the health officer, Dr. A. P. Brown, and assured of her aid, and that she would pay her proportion of the expense attendant upon the maintenance of a border quarantine. The same was promised at Marshall. At Texarkana the health officer of Bowie county, with whom I conferred, gave assurance of personal assistance, but informed me there were no available means pecuniary. At Sherman a city council meeting was held, and they could do nothing. The county judge, A. E. Wilkerson, of Grayson county, however, placed A. Q. Nash as officer, subject to the order of the central health officer at Denison. At Dallas, the city council, under Mayor Cabell, after some discussion, passed a resolution unanimously to take off local officers as soon as the border system was in working order; also appropriating $125 per month to help defray the border expenses. The board of health at Galveston held a meeting, and decided not to enter into the compact. So far the turbulent condition from one point to another, and one city and town against another, had been healed by this convention, Galveston holding aloof only on account of the local antagonisms between that place and Houston. Fever was now epidemic in New Orleans, epidemic in Memphis, and all along the lower Mississippi valley, and it reached as far as Little Rock, Arkansas. When all arrangements were completed, I placed videttes at Texarkana, Waskom, Orange or Sabine, and Denison, all points where railroads then entered the state. This being done, the first effort at quarantine upon the railway system was accomplished. The expenses of $600 per month for the border quarantine was pro-rated and defrayed by the cities of Houston, Dallas, Austin, Brenham, and Hempstead, the counties of Harris, Montgomery, and Grayson.

Again reverting to the convention of health officers in Houston, we moved towards the first permanent quarantine laws ever made by the state legislature. By this I allude to the laws enacted by the legislature of 1879 on state quarantine, and the creation of the office of state health officer, by which, in a great measure, the local boards of health were made subservient to the governor as the judge, and the state health officer as an investigator. The joint and effective efforts that had been made the year before on the border, resulting in the excluding from our state the great scourge that had made such havoc in our sister states,

settled the matter in the minds of the people. There was no longer any question. The need of a state quarantine law was urged. Railroads had opened their routes for the pestilence, and up to this time the law only looked to danger from the seaboard.

In 1879, having received the honorable appointment as the first state health officer of Texas under Gov. Oran M. Roberts, I entered upon my duties the first day of May upon the proclamation of the governor establishing quarantine at that date. Under an appropriation for that year of $12,500 the first state quarantine stations were built upon the coast,—viz., at Sabine Pass, Galveston, Pass Cavallo, Aransas Pass, and Brazos Santiago. The sites were to be selected for these stations, which necessitated a thorough investigation of the Gulf coast of Texas, a distance of about 560 miles from the mouth of the Sabine river to that of the Rio Grande. A cruise for this purpose was of necessity made in a sailing craft to enable me to explore all passes, both large and small. Contiguous to the gulf, and separated by bays from the mainland, is a line of islands beginning with Galveston and ending with Padre. There are only two points where the mainland reaches the gulf,—viz., from Sabine Pass to Galveston, and from San Louis Pass, at the west end of Galveston island, to the mouth of the San Bernard river. From this point Matagorda peninsula stretches to Pass Cavallo, the entrance to Indianola and Port Lavaca. After this comes Matagorda island to Aransas Pass, which is the entrance to Corpus Christi and Rock Port. Next comes St. Joseph's island, separated from Mustang by Dickinson's bayou. Corpus Christi Pass is the next inlet from the gulf, and there begins Padre island, 90 miles in length, reaching to Brazos Santiago, 12 miles from the mouth of Rio Grande, and the entrance for the port of Brownsville. I particularize, for the purpose of drawing attention to the fact that aside from the passes where ocean vessels could come there are numerous small inlets on the coast of Texas to be guarded, principally from the inroads of fruit vessels from Mexico, Yucatan, and British Honduras. During this season I made three trips along the coast, once accompanied by Dr. Jno. H. Pope, who was inspector of the National Board of Health. At Sabine Station Dr. Chamberlain was appointed as quarantine physician, serving until Dr. Perkins was appointed, who is still on duty at that station. At Galveston Dr. Maury Brown was quarantine officer with a crew of four men. He served four years. In 1882 Dr. Truehart was appointed. In 1883 Dr. Blunt became quarantine officer, and held until the present incumbent, Dr. F. K. Fisher, was appointed in 1888.

At San Louis Pass, Alonzo Follett quarantine guard.

At mouth of Brazos river, Dr. R. G. Turner first served; afterward Dr. Weisiger was appointed, and is still on duty.

At mouth of Bernard river, Laurant Decrow quarantine guard.

At Mitchell's Cut, John D. Gray placed on duty this year.

Pass Caballo, Dr. McCamley with two boatmen was placed on duty in 1879. In 1880 Dr. Shultz served a short time, and was succeeded by Dr. F. K. Fisher. In 1882 Dr. W. A. McCamley was again appointed.

In 1883 Dr. R. C. Hodges. In 1885 Dr. F. K. Fisher. In 1887 Dr. T. J. McFarland.

At Aransas Pass, Dr. T. S. Burke has been on duty since 1879.

At Corpus Christi Pass, quarantine guards.

At Brazos Santiago, and Brownsville, Dr. Main was appointed in 1879 and served until August 22, when he was succeeded by Dr. A. S. Wolff who still remains on duty.

In 1879 an interview was had by the state health officer with the Mexican General Canales, commanding the state of Taumalipas (in which is situated Matamoras, just across the river from Brownsville), resulting in a compact which proved a safeguard to both places. In this year also a cattle trade was successfully carried on between Indianola and Havana. The vessels were run under very stringent rules of non-intercourse, and were subjected to every precaution looking to the non-introduction of fever. Neither passengers nor freight were allowed, nor any new crew allowed to be shipped; no one allowed to land, either in Havana or Indianola. Each vessel on entering was compelled to undergo, at vessel's expense, a thorough fumigation. In ship's hold sulphur gas was used, but in cabin and sailors' department chlorine gas was used, the charge for fumigation being $15. When cattle were ready for the vessel, cars were backed down to T head of wharf, the ship signalled, and the cattle loaded by the ship's crew, thus avoiding all communication.

In 1880 occurred the usual routine of opening the quarantine system on the first of May. The quarantine buildings at the stations had been finished, and were this season occupied by the same officers at each pass without change, except at Indianola. The cattle trade with Havana was kept up again this year, the quarantine officers' report showing that not a single case of sickness occurred on the two ships during the season. At Brazos Santiago the quarantine station was swept away by a cyclone the 11th of August, with all state and private property. No fever this year, and quarantine closed November 1. In 1881 Gov. Roberts entered upon his second term of office. Dr. R. M. Swearingen, of Austin, was appointed to succeed Dr. R. Rutherford, of Houston, as state health officer. The season passed without fever, but with the coast quarantine in full effect from the 1st of May to the 1st of November.

The system of annual proclamation on the part of the governor on the first of May, and a quarantine system conducted under the government of the state legislature, with officers at all these points, existed until 1883 as a comparatively joint power, the local boards of health electing the officers, and comparatively governing the action of each of the officers, subject to the suggestion and revision of the governor and state health officer. This appeared to be a complication of affairs, and led to the passage of the laws of 1883, which transferred all the power of appointment and exercise of quarantine to the governor and state health officer, the local boards of health having been relegated to the position of sanitarians.

Passing from the points of law, to the operations under those existing, I first call attention to the fact that Texas suffered immunity from a comparatively unorganized system until 1882, when a total disregard of all the promises made on the part of the Mexican government admitted the fever into Matamoras. Once epidemic in Matamoras, its communication to Brownsville was a matter of a few days, where it became epidemic. After the state health officer had exhausted his appropriation, the matter of cordon sanataire was turned over to Dr. Spohn, of Corpus Christi, representing the U. S. Marine Hospital service. In attempting to return to his head-quarters at Austin, from Brownsville, the state health officer was himself held below Corpus Christi for twenty days in quarantine by local authorities.

The operations of 1883, 1884, 1885, and 1886 took their usual routine of declaration by the governor of quarantine, and restrictions placed upon all the coast. There was no fever during these years.

In 1887 Gen. L. L. S. Ross became governor of Texas, and I was reappointed state health officer. Found restrictions in force against cholera, which were continued. Railroad communication had now placed us in direct communication with the Pacific coast and Mexico. Fever began in Florida at Key West early in June. Later in this month it became evident that the various railroad connections in the state made us just as susceptible as we would be from the coast, and it was therefore thought wise by the governor of Texas to declare a quarantine, and place officers at Sabine, Logansport, Waskom, Texarkana, Paris, Denison, Gainsville, El Paso, Lerado, and Matamoras. A strict passenger and baggage surveillance was exercised over the fast trains. Regulations in regard to express, freights, mails, and other susceptible material were at the same time disseminated. The success of the operation requires no placarding. We had no fever in Texas, and in November, the temperature of Texas admitting the same, said quarantine was removed.

The 1st of May, 1888, as usual, quarantine was enforced upon our coast. In July it again became requisite for Texas to operate her border stations. The yellow-fever was again alive, and spreading in Florida.

On the 20th of July the governor's proclamation was issued establishing quarantine against Florida. Another followed in August against Georgia, Alabama, and Mississippi. These restrictions were removed by his excellency in October and November against Georgia, Alabama, and Mississippi. Restrictions against Florida are still in force. It soon became apparent that this was not a mere revulsive act, cautioning people not to come. Either unaware of the law, or willing to serve out a time of quarantine, they soon began to accumulate on our hands, so that at each of these stations we sometimes had the appearance of a military camp, having at Texarkana and Sabine, in several instances during the quarantine, from forty to eighty refugees on hand. This matter, forced upon us as quarantine authorities, gave us perhaps the

appearance of want of care; but when the matter comes to be properly viewed, it is evident to any reasonable man that quarantine stations could not be rebuilt at these points in the short period from June to August; therefore we had to rely upon the tent, which, possibly, in the main, was the safer of the two.

This brings the active operations up to date as a connective history of this quarantine. Suffice it to say, we have had no fever, nor ever a suspicious case.

Now, to go back in the history of this matter, I wish to call your attention to some of the expenditures made by the legislature and people of Texas for her coast and border defences. In 1879, under the first organization under the state law, $12,500 was appropriated to build stations along the coast and border. This was accomplished about the middle of the quarantine season of 1879, when the last station, at Brazos Santiago, was completed. In September of 1880 the station at Brazos Santiago was destroyed, and was rebuilt in 1887 at a cost of $4,500. Indianola, built in 1879, destroyed by storm in 1886, and rebuilt in 1887 at a cost of $1,750. Sabine, built in 1879, destroyed by cyclone in October, 1885, rebuilt in 1887. Galveston, built in 1870 by the city, destroyed in the hurricane of 1875, with the loss of Dr. Peete and Grandson; temporary structure placed in 1876 by the city of Galveston, and a new and complete residence and hospital built by the city in 1879, which was allowed to go to decay and destruction during Governor Ireland's administration. A new residence and state warehouse was built by a combination of the city and state, which was commenced in 1885, and is still extant. The station at Corpus Christi, or Shell Banks hospital, was destroyed by fire, and in 1883 the residence was removed one mile east. These stations constitute the coast defences. There were, also, houses built at Waskom, Texarkana, and Sabine in 1879, and allowed to go to decay, or were burned by tramps, except the one at Sabine where a guard had been kept.

There are many complications in the life of a quarantine officer, especially in the state of Texas, which do not come under the ordinary construction of a system of law; for instance, a community may become so excited as to demand, through their municipal powers, immediate or shot-gun relief. But the beauty of our system of law in Texas is, that it has prevented on three occasions this year the reënactment of the foolish tragedy at Shreveport, where it becomes necessary, under law, that a community shall make distinct statements of their cause of grievance, and this matter be first submitted to the executive before any action on their part shall be taken of a local nature. Thus time is allowed for the hot heads to cool off.

At the outset of this paper I gave you the history of the prevalence of yellow-fever in Texas from 1838 until 1867, showing the years of epidemic fever under the non-quarantine system; and again I have shown you, under the organized system properly provided for, from 1878 to 1888, or it might well be called from 1867 to 1888, the protec-

tion from incipiently prepared quarantine, and what perfect immunity there has been from 1878 to 1888 from a thoroughly organized system.

The past two years Texas has had in operation eighteen quarantine stations on her sea-coast and inland borders, exclusive of the smaller inlets on the coast.

Belonging to the coast service is one steam tug, one schooner, two sloops, and twelve small sail and boarding boats.

Appropriations made by the state for her quarantine service, which has been in operation for ten years, is as follows:

1879–'80,	$57,164.56
1881–'82,	92,827.16
1883–'84,	105,000.00
1885–'86,	80,000.00
1887–'88,	93,500.00

XVI.

THE BOSTON QUARANTINE.

By SAMUEL H. DURGIN, M. D.,
PRESIDENT OF THE BOSTON BOARD OF HEALTH.

The department of quarantine for the port of Boston is administered by a board of three health commissioners appointed by the mayor and aldermen of the city. Said commissioners carry into effect all the powers and duties that are conferred by statute law upon the city council as a board of health, and are authorized to make such regulations pertaining to quarantine, &c., as they may deem necessary for the protection of the public health.

The funds necessary for carrying on this department are appropriated by the city council, and amount to about sixteen thousand dollars a year.

An income is derived from the fees for inspecting and disinfecting vessels, for vaccinating immigrants, and for board of patients in the quarantine hospital, amounting to about six thousand dollars.

The equipage of the department consists of a steamboat thoroughly arranged for the convenience of the boarding officer, for the transportation of supplies, the transfer of patients to the hospital, and for supplying super-heated steam for disinfecting purposes.

An island of about twelve acres, well stocked, cultivated, and managed, for the immediate comfort and welfare of the sick and others detained in quarantine, a large storehouse, hospitals and tents sufficient to accommodate about three hundred; a disinfecting chamber on the wharf for the use of steam heat in the treatment of bedding, clothing, etc.

The regulations from June 1 to November 1 call for the inspection of all vessels from foreign ports, and from American ports south of Virginia. For the remainder of the year only such vessels are examined as have had on the voyage sickness of an infectious or doubtful character, and those bringing immigrants.

Prior to 1881 yellow-fever, typhus fever, cholera, and small-pox were the only diseases recognized as quarantinable; but since that date diphtheria, scarlet-fever, typhoid fever, and measles have been added to the list, and wherever these diseases are found they are at once removed to the hospital, and the vessel disinfected. The disinfectants used in the department are super-heated steam, bichloride of mercury, sulphurous acid gas, and chloride of lime.

All immigrants who do not show satisfactory evidence of protection against small-pox are vaccinated before landing. A record is made of

the name of the vessel, her master, where from, number of days on passage, number of persons on board, bill of health, sickness on passage, consignees, cargo, and sanitary condition of the vessel.

A daily report from the port physician gives a list of the vessels inspected, the ports from which they have sailed, and their sanitary condition. Another daily report from the same officer gives an account of each patient in hospital and other persons detained for observation.

A fee of from five to eight dollars is charged for the inspection of vessels, ten dollars for disinfection, ten dollars a week for board of patients, and twenty-five cents for each vaccination. These fees are established by the board of health, collected by the port physician, turned over by him to the city treasurer, and a detailed statement of the same rendered to the board of health once a month. Every officer in the department receives a stated salary, which constitutes his entire recompense for duties performed.

During the last twenty-five years of our quarantine work, twenty-two of which have been under my personal supervision, we have examined nearly 20,000 vessels. Of this number 177 were found to be infected, and on board of which there had occurred 250 cases of contagious disease,—viz., cholera, 4; typhus fever, 17; typhoid fever, 8; scarlet-fever, 5; measles, 51; small-pox, 81; yellow-fever, 84. These persons and vessels have been readily cared for, and in no instance, so far as we have any evidence, has a vessel failed to get thoroughly disinfected, nor has any infected person landed when disease could have been detected about him, or when he could have been reasonably suspected of incubating disease.

Small-pox may be contracted in Liverpool, and declare itself long after passing any inspection on our coast. An instance of this sort occurred about eighteen years ago, when an immigrant passed our quarantine and fell sick with small-pox in Lowell, Mass., after an incubation period of fifteen days, or five days after landing. Such instances can hardly occur now with the practice of vaccinating immigrants on their way across the ocean.

The special value, if any is to be attached to this brief statement of our work, must be looked for in the simple and permanent methods in use, together with the uniform results which have been obtained for a quarter of a century.

XVII.

YELLOW-FEVER PANICS AND USELESS QUARANTINES—LIMITATION BY TEMPERATURE AND ALTITUDE.

By JOHN H. RAUCH, M.D.,
Secretary Illinois State Board of Health.

Four years ago, on the 13th day of October, as the representative of the Illinois State Board of Health, at the opening of a National Conference of State Boards of Health, held at St. Louis, I made an address entitled "Practical Recommendations for the Exclusion and Prevention of Asiatic Cholera," which disease was then threatening to invade the United States. In the course of this address the status and the respective spheres of authority and action of the health services of the country,—national, state, and municipal,—were defined and discussed. It was pointed out that the practical abolition of the National Board of Health, as to its executive functions, devolved additional responsibility upon state and municipal authorities, and it was urged that these should voluntarily combine for coöperation and concert of action in the face of what then seemed a pressing emergency. It was urged that in "states which have no boards of health, or whose boards are not vested with the necessary authority or provided with adequate resources, the people should be awakened to the necessities of the situation. Legislators should be thoroughly informed as to the facts, and urged to provide suitable legislation." It was also urged that congress should reorganize and rehabilitate the National Board of Health, or provide an efficient substitute—one clothed with increased power and supplied with ample funds to maintain an effective system of modern quarantine for the exterior; to maintain an interior sanitary inspection service for the great highways of travel by land and water; and to give judicious coöperation and substantial assistance to states and municipalities in preventing the introduction of epidemic diseases into one state from another, and in preventing their spread within the states themselves.

In further advocacy of this point I used the following language:

"Sooner or later the national government will be compelled not only to assume supervision of exterior quarantines, but to provide for a permanent system of coöperation with state and local governments in the administration of interstate sanitation, in order, on the one hand, to prevent the introduction of exotic epidemic diseases, and, on the other, to prevent their spread from state to state along the great intra-national highways of travel and commerce. This is a national duty. It is one that the national government only can adequately discharge, and its

expense is, equitably, one which should be defrayed from the national treasury.

"Such an organization as I suggest will be one agency for securing the assumption of this duty by the general government; and the present emergency offers a favorable time for pressing its consideration. Heretofore, legislation in the interest of public health has been obtained, as a rule, at the tail-end of an epidemic. It has too often been in the nature of locking the stable door after the horse was stolen. Let us now see if we cannot reverse the process, and, while there is yet time, induce not only congress, but states and municipalities, to take the necessary action for securing a better protection of the public health.

"Just now this means more than the good to be found in the saving of human life and in avoiding the suffering and misery, the ruined homes and desolated families which an epidemic always leaves in its track. It means the prevention of panic; it means the prevention of the interruption of trade and commerce; it means the prevention of the loss of millions of dollars, all of which would inevitably result from an epidemic of Asiatic cholera in this country. Already the disease has cost southern Europe not less than a hundred million dollars—six million dollars up to October 1st in trying to prevent its spread in Italy alone, with a loss of four million dollars even in the month of August, before the disease had effected a serious foot-hold; and now it is announced that the decrease of the national revenues of France has been materially aggravated by the reduction of receipts from railways, caused by the cessation of travel consequent upon the prevalence of the cholera epidemic.

"Shall we be warned in time, or shall we wait until the pestilence has landed and obtained a foothold? A single outbreak—possibly a single case—of Asiatic cholera in New York, or Chicago, or St. Louis, or New Orleans, in our present condition, would cost the country millions of dollars, even though no epidemic spread should result. In 1879 the report of a single case of yellow-fever in the south caused a shrinkage in the provision market, in Chicago alone, which amounted to a million of dollars within twenty-four hours.

"With a perfectly feasible quarantine system, whose entire cost would not be a tithe of the losses of one epidemic, the chances of that single case may be made exceedingly remote. With an adequate sanitary organization—embracing within its scope the national authority, the state and the municipal, each in its respective sphere—not one case, nor one hundred, could establish an epidemic.

"Such an organization of the sanitary defences would inspire public confidence, and prevent panic in the face of real danger; and panic is one of the worst complications of an epidemic, as fear is one of the most potent predisposing causes of epidemic disease."

All this was said and published four years ago, and within the last few months the country has witnessed the realization of every prediction of the results which it was then asserted would inevitably follow the neglect to secure an adequate organization of the sanitary defences of the

country. An epidemic of yellow-fever, almost entirely confined to the boundaries of one sparsely settled and feasibly isolated state, has caused widespread panic, the loss of millions upon millions of dollars in paralyzed business and embarrassed industries, and vexatious and often cruel interruption or suspension of travel by "shot-gun quarantines" with all their attendant barbarities and high-handed outrages, culminating in the arrest and imprisonment of harmless fugitives a thousand miles away from any infected locality, and the cold-blooded murder of travellers seeking to return to their own homes. Over and above all this, it is within bounds to assert that the aggregate suffering, disease, and loss of life caused by this panic, and its consequences of exposure, privation, and effects upon the nervous system, will ultimately exceed the aggregate of suffering and loss of life by the epidemic disease itself.

I have prepared a succinct account of the epidemic up to a recent date, but for the purposes of this paper it is necessary to add certain information bearing upon the economic questions involved, to secure which I have addressed a communication to the various transportation agencies in the area affected by the Florida epidemic, and the effect of the existence of the disease at Decatur, Alabama, and at Jackson, Mississippi.

It is also necessary to ascertain as nearly as possible the pecuniary loss entailed upon individuals and municipalities, independent of the loss of life and suffering incident thereto, as this seems to be the more potent factor in securing concert of action to obtain necessary means to prevent a recurrence of another epidemic. I have received numerous replies, but as the epidemic has not entirely come to an end, this portion of the paper must remain uncompleted.

It is with the efforts above referred to, for the prevention or abandonment of unnecessary interference with travel and traffic, and to restoring public confidence, that I shall now deal. During the earlier months of the spring my attention had been attracted to certain suspicious circumstances relating to Florida, among which may be noted the declaration of quarantine by Denmark against all Florida ports, and rumors of the existence of a suspicious form of fever at various places on the peninsula. There had been similar rumors, followed by more or less emphatic denials, during the previous season; but it was taken for granted that the Marine Hospital Bureau, in discharging the duties of a national sanitary service, was fully advised and would make authoritative announcement if there was any ground for warning. It was not, however, until April 20th, that the bureau announced the recent existence of yellow-fever at Micanopy, Plant City, and Bartow, and "that several other points in the southern and western portions of the state are to be looked upon as suspicious." Gradually the facts leaked out that yellow-fever, modified by temperature, had existed during the winter, and that the territory between Tampa and Jacksonville was infected. The weekly abstract of the Marine Hospital Bureau, for the week ended April 26th, contained the first circumstantial statements to this effect, and it is noteworthy that they are contained in reports dated March 13th and 17th,—that is, six

weeks before their publication. In one of these reports it is stated that a continued fever, "resulting in from 6 to 8 per cent. of deaths," had been prevalent in Jacksonville for over two months, and that two physicians disagreed with the diagnosis of typhoid fever, one of them holding "the idea of a yellow-fever wave overspreading the city." The report of March 13th, dated at Plant City, begins with the unqualified assertion that "there is yellow-fever at this place, and evidently at other places in the state, of which due report will be made." And both reports urge the suppression of the information in deference to the local sentiment, no doubt prompted by supposed business interests.

These indications lost none of their significance, but, the contrary, from the belief that the introduction of the infection into the interior from Tampa, in May, 1887, and its subsequent unchecked diffusion, were due to the policy of concealment and suppression of information by local health and quarantine authorities in Florida; nor from the knowledge that the supervising surgeon of the Marine Hospital Bureau could "not do anything in regard to malignant diseases appearing in any part of the country until officially informed by the executive of the state in which such disease existed that it was in an epidemic form, and, therefore, called for the national succor." Thus admonished, it became the duty of every sanitary executive to study the developments of the situation with especial reference to the territory under his own immediate care.

In Illinois, the only point of danger was the city of Cairo, and I at once began a systematic observation of the meteorological and other conditions, not only of that place, but of the important points in the Mississippi valley. Since the result of these observations largely influenced my official action as the executive and representative of the Illinois State Board of Health, it will be well to clearly state the ground of my confidence in refusing to sanction the enforcement of quarantine in Illinois during the past season, and in advising against such procedure in certain other localities.

Among the few things which we do know positively and definitely concerning yellow-fever, are its relations to heat and cold. Without knowing, with certainty, what its particulate cause may be, we do know that a temperature below 32° F. destroys the vitality of the cause, and that a continuous temperature of not less than 70° F. is necessary for its origin and spread. In this country, even in the Gulf states, yellow-fever occurs as an epidemic only when the mean temperature rises to that of the tropical regions, and there is no instance of its epidemic spread in places north of 35° north latitude, except, in the language of Professor Hirsch, "when the heat has equalled the mean annual temperature of the tropics; and it has on no occasion become diffused in a temperature below 20° C. (68° F.), the winter temperature of the tropics."[1]

As early as the beginning of the latter third of August it became apparent that the temperature necessary for a yellow-fever epidemic in Cairo would not be much longer maintained, and in my correspondence at this

[1] Hirsch's Geographical and Historical Pathology, vol. 1, page 351.

time I maintained this view, writing, for example, on the 23d, to Dr. Garrison, of the West Virginia State Board of Health, in reply to his queries, that I did not think it necessary to do anything with regard to yellow-fever; that the season was too far advanced, with the prevailing low temperature, to warrant any anticipation that the disease could extend much beyond the limits of Florida. On the 22d of the month the mean temperature was only 67.5°; on the following day it was only 66.5°, and although there was subsequently an increase on the 25th to 76.5°, the average mean temperature for the last ten days of August was 71.4°, and for the month was 74.5°. This latter was 3° lower than the average for 18 years—the entire period covered by the signal-service observations—and the lowest recorded in 13 years, or since 1875. During this period, or rather for the previous 17 years, the September temperature had averaged about 8° lower than the August temperature, so that if only this average reduction should be maintained, the temperature for September, 1888, would be at least 1.5° below the minimum point which all authorities agree to be necessary for the diffusion of the yellow-fever poison. As a matter of fact, the deficiency for the month proved to be more than double this—the mean temperature for last September being only 64.8°—the lowest ever recorded for that month at Cairo. Subjoined are sundry tables compiled during the course of these observations, and since completed from the meteorological tables in the various annual reports of the Illinois State Board of Health, and from data kindly furnished by General Greeley, chief signal officer U. S. A.:

TABLE No. 1.

Mean Temperature at Cairo, Ill., July, August, September, for 18 *years*—1871–1888 *inclusive.*

Years.	July.	August.	September.	Means of 3 Months.
1871	79.3	79.5	67.2	75.3
1872	80.3	79.9	70.6	76.9
1873	78.8	78.6	68.8	75.4
1874	79.3	78.9	72.1	76.8
1875	78.8	73.6	68.0	73.5
1876	79.6	77.5	68.5	75.2
1877	78.7	77.5	70.0	75.4
1878	82.5	81.0	68.9	77.5
1879	82.5	75.8	66.8	75.0
1880	78.7	78.4	67.1	74.7
1881	82.3	84.8	75.1	80.0
1882	75.8	75.1	68.9	73.2
1883	77.7	74.8	68.0	73.5
1884	78.2	75.4	74.2	75.7
1885	80.0	76.5	69.3	75.2
1886	78.1	76.8	70.8	75.2
1887	80.5	78.0	71.1	76.5
1888	79.5	74.5	64.8	72.9

TABLE No. 2.

Average Mean Temperature, Cairo, Ill., July, August, September, from 1871 *to* 1888 *inclusive, and Mean Temperature in certain years.*

	July.	August.	September.	Means of 3 Months.
Average mean for 18 years	79.4	77.5	69.4	75.4
Mean in 1873	78.8	78.6	68.8	75.4
" 1878	82.5	81.0	68.9	77.5
" 1888	79.5	74.5	64.8	72.9
Highest means—1881	82.3	82.7	75.1	80.0

The July temperature in 1888 was about normal; the August temperature 3° below, and September 4.6° below the normal, while the mean for the three months is the lowest on record.

TABLE No. 3.

Daily Temperature and Precipitation, Barometric Pressure and Wind Movement, at Cairo, Ill., July, August, September, 1888.

JULY.

Date.	Temperature. Mean.	Maximum.	Minimum.	Precipitation in inches and hundredths.
1	78.5	87.0	67.2	.00
2	83.0	92.0	72.5	.00
3	83.0	91.0	76.0	*
4	83.5	91.5	75.5	.00
5	81.0	90.0	76.6	.00
6	83.5	91.0	75.4	.00
7	85.5	94.5	76.0	.00
8	80.5	88.9	74.9	.13
9	77.5	86.0	71.0	.64
10	75.0	81.5	72.2	.49
11	76.5	86.5	68.4	.00
12	81.0	89.3	69.8	.00
13	80.5	90.7	74.5	.00
14	73.5	82.0	68.8	.00
15	76.5	85.1	65.5	.00
16	79.5	89.6	73.1	.00
17	76.5	83.7	72.0	1.10
18	79.0	84.9	67.0	.94
19	77.0	82.5	71.0	*
20	73.0	81.5	65.5	.00
21	74.5	83.0	64.8	.00
22	76.5	86.0	67.5	.00
23	78.0	89.8	69.5	.00
24	81.5	89.8	73.0	.00
25	80.5	91.3	72.5	.00
26	79.5	90.8	74.0	.00
27	81.0	89.6	73.0	.00
28	79.0	88.8	72.8	.02
29	81.0	88.6	76.0	*
30	83.5	91.8	76.6	.00
31	86.0	95.0	76.1	.00

SUMMARY.

Mean barometer, 8 A. M., 30.067; 8 P. M., 30.005.
Highest barometer, 30,18—date, 20th.
Lowest barometer, 29.88—date, 9th.
Monthly range of barometer, .30.
Mean temperature, 79.5.
Highest temperature, 95.0—date, 31st.
Lowest temperature, 64.8—date, 21st.
Monthly range of temperature, 30.2.
Greatest daily range of temperature, 20.3—date, 23d.
Least daily range of temperature, 9.3—date, 10th.
Mean daily range of temperature, 16.3.
Mean maximum temperature, 88.2.
Mean minimum temperature, 71.9.

Mean temperature for this month in—

1871	79.3	1880	78.5
1872	80.3	1881	82.3
1873	78.8	1882	75.8
1874	79.3	1883	77.7
1875	78.9	1884	78.2
1876	79.6	1885	80.0
1877	78.7	1886	78.1
1878	82.5	1887	80.5
1879	82.0	1888	79.5

Prevailing direction of wind (8 A. M. and 8 P. M.), N.
Total movement of wind, 3789 miles.
Highest velocity of wind, direction, and date, 48 S. W., 9th.
Total precipitation, 3.32 inches.

Number of days on which .01 inch or more of precipitation fell, 7.
Total precipitation (in inches and hundredths) for this month in—

1871	5.97	1880	4.34
1872	3.45	1881	0.18
1873	1.68	1882	5.25
1874	0.52	1883	7.97
1875	9.88	1884	7.34
1876	3.44	1885	0.82
1877	5.63	1886	1.01
1878	2.81	1887	1.42
1879	1.37	1888	3.32

NOTE. Barometer reduced to sea level. The (*) indicates precipitation inappreciable.

AUGUST.

Date.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Precipitation in inches and hundredths.
1	85.5	96.1	77.0	.00
2	86.0	97.0	77.0	.00
3	81.5	91.0	75.5	.30
4	76.5	85.2	73.5	.12
5	75.5	89.5	66.5	.60
6	80.5	88.2	72.0	.06
7	80.5	91.0	76.5	.00
8	74.5	84.5	69.8	.01
9	69.5	77.8	63.0	.00
10	72.5	85.7	60.4	.00
11	75.5	87.5	67.0	.00
12	75.5	80.4	66.8	*
13	69.0	80.6	62.0	.00
14	73.0	86.4	62.5	.00
15	80.0	91.0	70.2	.00
16	73.5	77.5	70.0	.66
17	75.5	86.0	74.0	*
18	72.0	79.4	70.0	.32
19	72.5	76.8	70.0	1.10
20	72.0	79.0	69.4	.14
21	72.5	78.5	68.9	1.22
22	67.5	75.5	64.5	.00
23	66.5	76.5	58.0	.00
24	71.0	84.8	58.2	.00
25	76.5	88.0	68.8	.00
26	72.5	85.5	71.0	.18
27	72.0	76.2	69.4	.64
28	71.0	78.4	63.5	.03
29	73.5	82.6	68.5	.00
30	71.5	79.0	67.5	*
31	72.5	78.5	69.8	.07

SUMMARY.

Mean barometer, 8 A. M., 30.055; 8 P. M., 29.996.
Highest barometer, 29.88—date, 23d.
Lowest barometer, 29.35—date, 20th.
Monthly range of barometer, 53 inches.
Mean temperature, 74.5.
Highest temperature, 97.0—date, 2d.
Lowest temperature, 58.0—date, 23d.
Monthly range of temperature, 39.0.
Greatest daily range of temperature, 26.6—date, 26th.
Least daily range of temperature, 6.8—date, 27th.
Mean daily range of temperature, 15.4.

Mean temperature for this month in—

1871	79.5	1880	78.4
1872	79.9	1881	82.7
1873	78.6	1882	75.1
1874	78.9	1883	74.8
1875	73.6	1884	75.4
1876	77.5	1885	76.5
1877	77.5	1886	76.8
1878	81.0	1887	78.0
1879	75.8	1888	74.5

Mean monthly dew point, 67.1.
Mean monthly relative humidity, 78.8.
Prevailing direction of wind, 8 A. M. and 8 P. M., N.
Total movement of wind, 4549 miles.
Highest velocity of wind, direction, and date, 45 W., 5th.
Total precipitation, 5.45 inches.

Number of days on which .01 inch or more of precipitation fell, 15.
Total precipitation (in inches and hundredths) for this month in—

1871	2.22	1880	3.65
1872	0.19	1881	0.11
1873	2.48	1882	3.46
1874	2.79	1883	1.73
1875	3.32	1884	2.74
1876	5.24	1885	2.40
1877	1.58	1886	2.84
1878	3.45	1887	1.10
1879	7.05	1888	5.45

Number of clear days, 3.
Number of fair days, 12.
Number of cloudy days, 16.

NOTE. Barometer reduced to sea level. The (*) indicates precipitation inappreciable.

SEPTEMBER.

Date.	Temperature. Mean.	Maximum.	Minimum.	Precipitation in inches and hundredths.
1	62	75	57	*
2	65	75	58	.00
3	68	78	59	.00
4	70	80	64	.00
5	68	79	63	.00
6	70	81	62	.00
7	72	82	67	.08
8	73	84	69	*
9	73	84	66	†.01
10	68	82	60	.00
11	70	84	60	.00
12	70	85	62	†.02
13	63	74	58	.00
14	64	80	55	.00
15	63	71	60	.01
16	59	69	66	.03
17	57	69	49	.00
18	64	76	58	.00
19	68	77	61	.00
20	72	88	65	.00
21	69	88	66	.02
22	68	74	64	.11
23	65	76	61	*
24	64	75	57	.00
25	63	75	56	.00
26	59	74	51	.00
27	56	65	54	.00
28	54	65	46	.00
29	52	60	45	.00
30	54	68	42	.00

Summary.

Mean barometer, reduced, 30.074.
Highest barometer, 30.44—date, 29th.
Lowest barometer, 29.85—date, 16th.
Monthly range of barometer, 59 in.
Mean temperature, 64.8.
Highest temperature, 87.9—date, 20th.
Lowest temperature, 42.5—date, 30th.
Monthly range of temperature, 45.4.
Greatest daily range of temperature, 25.
Least daily range of temperature, 9.9.
Mean daily range of temperature, 18.2.
Mean maximum temperature, 76.5; minimum temperature, 58.4.
Mean temperature for the month in—

1871	67.2	1880	67.1
1872	70.6	1881	75.1
1873	68.8	1882	68.9
1874	72.1	1883	68.0
1875	68.0	1884	74.2
1876	68.5	1885	69.3
1877	70.0	1886	70.8
1878	68.9	1887	71.1
1879	66.8	1888	64.8

Mean daily dew point, 56.8.
Mean daily relative humidity, 76.4.
Prevailing direction of wind (8 A. M. and 8 P. M.), N.
Total movement of wind, 4452 miles.
Highest velocity of wind, direction, and date, 24 N. and S. W., 1st and 16th.
Total precipitation, 28 inches.

Number of days on which .01 inch or more of precipitation fell, 5.
Total precipitation (in inches and hundreds) for this month in—

1871	2.34	1880	4.55
1872	2.56	1881	3.74
1873	4.09	1882	3.28
1874	3.14	1883	0.34
1875	0.16	1884	5.02
1876	0.73	1885	4.76
1877	3.15	1886	2.52
1878	2.99	1887	1.67
1879	0.93	1888	0.28

Number of clear days, 12.
Number of fair days, 12.
Number of cloudy days, 6.
Dates of frosts, light, 28th and 30th, killing none.

NOTE. Barometer reduced to sea level. The (*) indicates precipitation inappreciable.
†Fog precipitation.

These observations were not confined to Cairo, but embraced the important points from Chicago to New Orleans, and from Jacksonville, Florida, to New York city. They included a study of the weekly weather crop bulletins issued from the signal office at Washington, the value of which for epidemiological purposes cannot be over-estimated. I quote the comments on temperature in Bulletin No. 26, as an illustration:

Temperature.—The week ending August 18th has been slightly warmer than usual on the middle Atlantic coast, in southern New England, and in the interior of the Southern states, while it has been cooler than usual in all other sections east of the Rocky Mountains, except in western Kansas, where the temperature was about normal. In the wheat and corn regions of the north-west and central valleys the average daily temperature was from 4° to 6° lower than usual. Light frosts occurred in Minnesota and Dakota, and killing frosts were reported from St. Vincent on Friday morning, where the minimum temperature was as low as 34°.

The temperature for the season, from January 1st to August 18th, continues unusually low in the north-west and the lake regions, where the temperature has been from 3° to 6° lower than the average of previous years. Throughout the Southern states the temperature for the season has differed but slightly from the normal, the departure being generally less than one degree.

For the 231 days from January 1 to August 18, the temperature in the Southern states, and including as far north as Memphis (latitude 35°, 71 min. N.), was, as thus stated, only slightly below the normal. But within the next four weeks the same conditions noted for the north-west and lake regions began to obtain in the Mississippi valley, so that by September 15 the daily temperature was from 3° to 5° lower than the average of previous years. Thus, up to the 18th of August the daily temperature had averaged only 1.7° less than the normal in St. Louis, 1.6° less in Cairo, not quite .8° less in Memphis, 1° less in Vicksburg, and 1.2° less in New Orleans. By the middle of September the weather had grown so much cooler as to show average daily deficiencies during the intervening 28 days of 4.4° in St. Louis, 5.2° in Cairo, 4° in Memphis, 4.1° in Vicksburg, and 3° in New Orleans. For the corresponding periods the deficiency in Nashville had been 1.5° up to August 18, and 5.4° between that date and September 15. Following is a tabular statement of these phenomena for eighteen principal cities:

TABLE No. 4.

Departure from Normal Temperature—Deficiency in Degrees Fahr. at Cairo, Ill., and other points—January 1 *to August* 18, *and August* 19 *to September* 15, 1888.

Cities.	Deficiency in Degrees Fahr.			
	January 1—August 18.		August 19—September 15.	
	Aggregate.	Average 231 days.	Aggregate.	Average 28 days.
Keokuk, Iowa	822°	3.5°	155°	5.5°
Nashville, Tenn	362	1.5	151	5.4
Cairo, Ill	376	1.6	145	5.2
Springfield, Ill	784	3.4	138	4.9
Davenport, Ia	978	4.2	133	4.7
St. Louis, Mo	393	2.7	125	4.4
Vicksburg, Miss	238	1.+	115	4.1
Memphis, Tenn	180	0.8	112	4.0
Baltimore, Md	548	2.3	103	3.7
Philadelphia, Pa	276	1.2	99	3.5
Chicago, Ill	671	2.9	90	3.2
New Orleans, La	276	1.2	86	3.+
Savannah, Ga	323	1.4	78	2.8
New York, N. Y	256	1.1	78	2.8
Jacksonville, Fla	99	0.4	77	2.7
Wilmington, N. C	284	1.2	53	2.–
Charleston, S. C	175	0.7	42	1.5

While the city of Cairo is clearly within the isotherm of epidemic yellow-fever during the months of July, August, and September, and under the usual meteorological conditions, it is manifest from the foregoing that these conditions did not obtain during the present year, and that before the middle of September all possible danger of diffusion from the introduction of yellow-fever infection had passed. It should be further observed that at no time was the city exposed, as in 1873 and 1878, by close communication with any infected district. In the former year, with an average mean temperature of over 75°, cotton, hides, and other freight were received in large quantities direct from Shreveport and Memphis, where yellow-fever was raging, and yellow-fever cases were landed at Cairo from three different boats in the month of August. Even then only those among the citizens who handled or came in contact

with the infected freight, or members of the families of such persons, contracted the disease; and there was no case due to the patients received, although four of these were in the state of collapse when landed, and died soon after with black vomit. The disease did, however, occur at Centralia, 100 miles above Cairo, among those engaged in transshipping hides from Shreveport—there being a total of five cases with three deaths. Similarly, in 1878, during the hottest summer on record with one exception, and while the valley was infected from Memphis to the Gulf, intercourse with the epidemic centres was only nominally restricted,—the death-ship "Porter" landing cargoes of infection in August, and the "James D. Parker" so late as August 24, when the fever had been declared epidemic in Memphis for more than a month, establishing a centre of infection on Poplar street, to which the origin of the Cairo epidemic of that year is attributed.

Neither climatic conditions, nor conditions of exposure to the infection by water communication—the most dangerous and usual medium of diffusing a yellow-fever epidemic—obtained at Cairo this year, and by the 1st of September I had dismissed whatever apprehension might have been felt on this score. The general health of the valley was good, and the sanitary status of Cairo itself was satisfactory.

Meanwhile, in the territory beyond Illinois panic was spreading and quarantines multiplying. There was growing distrust of the management of the epidemic in the infected region, and railroad lines entering the state from the south and south-east were subjected to various restrictions, which foreshadowed non-intercourse quarantines enforced by the shot-gun. The disease was still confined to the Florida peninsula, but its effects upon the business interests of the country were daily becoming more widespread and marked, and the necessity was obvious for some action on the part of health authorities which would arrest the tendency to panic and restore confidence.

On the 14th of September I received a letter from Dr. J. D. Plunket, president of the Tennessee State Board of Health, inviting me to a conference to be held in Nashville on the 18th, for the purpose of considering the epidemic in Florida and its management. I spent Saturday in Chicago on official business, and started for Nashville on the afternoon of the 16th. Both in Chicago and at other points the representatives of the press were eager to obtain the views of sanitarians and health officials on what had become an engrossing topic, and I availed myself of these opportunities to present the reasons which influenced my official action. I publicly opposed the applications of unacclimated physicians and nurses to be sent to Florida, stating that "Unacclimated people, or those who have not had yellow-fever, have no business going down there now to contract the disease and add to the number to be cared for. It may be very philanthropic and heroic, but it isn't common-sense. There are plenty of medical men and nurses South who have had yellow-fever and who know how to treat the disease, whilst the Northern people do not, as they have had no experience with it."

Concerning the general situation, and the probability of a spread of the epidemic, it was pointed out that "It is now too late in the season for yellow-fever to spread in or to this state. There must be continued high temperature in order that yellow-fever should spread as an epidemic. There is no danger in any part of the country north of the southern boundary of Tennessee and North Carolina, and probably there is no likelihood of any further spread of the fever except in the Gulf states. As the executive officer of the State Board of Health of Illinois in charge of quarantine, I have been and am still perfectly willing to allow the Florida yellow-fever refugees to come to this state, knowing that there is no danger.

"Florida has, unfortunately, no state board of health, and, as a necessary consequence, there is no supervision or control over the entire state by a central authority, so that the situation is aggravated by county boards quarantining against one another, complicating the situation, and thus adding to the panic. The Texas quarantine against New Orleans is wholly unnecessary and unwarranted, as there is no yellow-fever at New Orleans, and only during its prevalence would the quarantine be justifiable.

"Our efforts at Nashville will be directed toward restoring confidence, and preventing foolish and useless quarantines. There has never been anything in the situation to warrant interference with travel and commercial intercourse except with the points directly infected. In 1879, notwithstanding the fact that we had yellow-fever at Memphis and some thirty-eight or forty other points between that place and the gulf, there was no such alarm and interruption of business.

"The National Board of Health had a good system of inspection, isolation, depopulation of infected places, and sanitary supervision of travel and traffic both by land and water; its certificates were based on actual knowledge, and commanded confidence wherever they were presented. The Illinois Central Railway Company and other important transportation agencies are on record to the effect that the work of the national board during that season was of inestimable benefit to the whole valley, and made a difference of millions of dollars in the volume of business.

"As compared with the interests involved and the extent of territory infected from the previous year,—for it should be remembered that the epidemic of 1879 was carried over from 1878, just as it is claimed this epidemic is the result of cases which occurred last fall,—in these respects this Florida outbreak bears no comparison to the gravity of the situation in 1879 in the Mississippi valley.

"It furnishes no good reason for the degree of alarm and excitement which obtains. I trust this Nashville conference will be able to restore confidence, and prevent further unnecessary interference with the business interests of the country."[1]

The conference was attended by Drs. J. D. Plunkett, president, and

[1] See *Chicago Daily News*, September 16, 1888.

J. Berrien Lindsley, secretary, of the Tennessee State Board of Health; Dr. Jerome Cochran, state health officer of Alabama; Dr. C. P. Wilkinson, president State Board of Health of Louisiana; Dr. H. D. Frazer, secretary State Board of Health of South Carolina; Drs. J. N. McCormack, secretary, and J. O. McReynolds, State Board of Health of Kentucky; and Dr. J. H. Rauch, secretary State Board of Health of Illinois.

Florida and Georgia having no state boards of health were not represented in the conference; and to this extent it was embarrassed in its purpose of securing coöperation and concert of action by state health authorities in the entire area affected by the Florida epidemic, with the view of providing all necessary protection for the public health by agencies which would command public confidence, and thus prevent unnecessary interference with travel and traffic, allay groundless fear, and prevent panic.

During the session I advocated the views already outlined, stating that my concern, as a state official of Illinois, was chiefly with the business interests involved and threatened. As chairman of the Committee of Quarantine of the International Conference of State Boards of Health, I was interested in limiting the spread of the disease, and preventing unnecessary suffering by useless quarantines. I urged that, on the ground of humanity, the terror-stricken refugees should be allowed to get north of the danger line as speedily as possible; that quarantines of observation and detention for those desirous of coming into or passing through North Carolina, Tennessee, Kentucky, and Illinois were not justified by the lateness of the season, the low temperature, the character and extent of the epidemic, nor by our experience of previous epidemics and our knowledge of yellow-fever. In 1878 thousands of fugitives from Memphis and below were allowed to come into Illinois and Missouri; and although thirty-eight of these died of the disease in our own state, there was not a single case contracted from the refugees nor their effects outside of Cairo, where the temperature was the highest that had ever been recorded up to that time.

The conference discussed and finally adopted the following propositions:

1. That owing to the lateness of the season, and the unusually low temperature prevailing, there is no danger to be apprehended from the reception of fugitives from the yellow-fever district by any community north of latitude 36° 30′ north—the northern boundary of Tennessee.

2. That it is the duty of health and municipal authorities to prevent indiscriminate quarantines; and no place should be quarantined against until it has been definitely pronounced infected by yellow-fever.

3. That it is not necessary to detain persons who wish to go north beyond the danger line in camps of observation for ten days.

4. That the management of the epidemic in Florida thus far has not been satisfactory, and a change in the methods is necessary.

In this connection I wish to record my appreciation of the work done

by the state boards of health of Tennessee and Kentucky, both in the interests of Illinois and of their own commonwealths. Dr. Plunket's action in calling this conference was wise and timely, and the attitude of the Tennessee board was ably supported by that of Kentucky. In my judgment the action of these boards was of greater pecuniary value to the material interests of their respective states than the total sum ever likely to be appropriated for their maintenance. In fact, I am satisfied that if it had not been for the coöperation of the state boards of health of these three states, none of the refugees would have been allowed to pass northward through this territory.

While at Nashville I received a telegram from the office of the board—with which I was in constant communication—announcing that Cairo had quarantined against Jacksonville, Fla., and Decatur, Ala., and asking financial aid from the board for the pay of inspectors. The sickness at Decatur had not at this time (September 17) been definitely pronounced yellow-fever. Aside from this, however, the considerations already set forth forbade me, as the executive officer and representative of the board, from assisting by the use of the public moneys of the state, or from giving the authority of the board to a quarantine which was wholly unnecessary and unjustifiable on the score of the public health; which, to the extent that it was enforced, would be detrimental to the public revenues; and which to the same extent would injuriously affect the business and industries of the communities concerned.

I felt so strongly convinced of the soundness of the premises upon which my conclusions were based, and upon the extent and accuracy of my information, which embraced every important point in the valley and Gulf states, that I at once sent the following dispatch:

NASHVILLE, TENN., September 17, 1888.

TO S. M. ORR, HEALTH OFFICER, CAIRO, ILL.:

Make no attempt to enforce quarantine. No possible danger from yellow-fever. Season too late. State board will not expend any money for such purpose, for the reason that it is wholly unnecessary. The existence of yellow-fever at Decatur is still a matter of doubt. Am here on sanitary and quarantine business.

JOHN H. RAUCH.

Dr. Cochran subsequently pronounced the cases at Decatur to be yellow-fever, and further telegrams from the same officer kept me advised of the developments,—the extent of the depopulation of the town before the place became dangerously infected, the subsequent establishment of a cordon, etc.

In the same way communication was maintained with Dr. Rutherford, state health officer of Texas; Drs. Wilkinson and Salomon, of the State Board of Health of Louisiana; Dr. Wirt Johnson, secretary of the Mississippi State Board of Health; Dr. McCormack, secretary of the Kentucky State Board of Health; Dr. Plunkett, president of the Tennessee State Board of Health; Dr. G. B. Thornton, president of the Memphis Board of Health; Dr. Thomas F. Wood, secretary of the

North Carolina State Board of Health, and others, so that I was informed daily of the situation in the infected and threatened districts.

After participating in the conference at Nashville, I proceeded to Washington *via* Chattanooga; and, although coming from Nashville that day, before I was allowed to enter Chattanooga I was required to show a certificate. I found Chattanooga in a panicky condition, owing to the death of a refugee from Decatur at Wildwood in Georgia. The patient was removed from a train at Wauhatchie by the Chattanooga authorities. The probabilities are that the exposure incident to his lying in the rain on the platform of the depot hastened his death. Chattanooga authorities no doubt thought that this saved their city from pestilence, although at that time there was scarcely a possibility of yellow-fever obtaining a foothold there.

Here I desire to call particular attention to the manner in which suspects in some of the states, and those prostrated by the fever, have been treated by the enforcement of so called quarantines. This hunting down of unfortunates, who are left to die because they have, or are suspected to have, yellow-fever, should no longer be tolerated in this country. No place, city, or town should have the power to exercise quarantine unless it has at the same time the means of taking care of those detained.

Upon approaching Washington I was met by a quarantine inspector, who simply asked me from whence I came. Comment is unnecessary.

On September 20 it was definitely announced that there was yellow-fever at Decatur, and on the 21st at Jackson, Miss. The panic that ensued from these announcements spread throughout the Gulf states, and the effect of the same was plainly visible north of the danger line. Within forty-eight hours after the announcement of the occurrence of the cases at Jackson, Miss., every wheel was stopped on a line of rail extending from the Gulf to Cairo, and on two other lines the stoppage of traffic was nearly as complete, while the steamboat companies were obliged to lay up, although there was not a case of yellow-fever along the whole of the Mississippi river. In Washington there was an uneasy feeling in the community. In Philadelphia the board of health requested the Marine Hospital Service to continue its quarantine inspection after the first of October at the Delaware breakwater. A medical society in New York passed a resolution asking that quarantine be more rigidly enforced against the infected localities. Two unfortunate victims were arrested by the health authorities of New York city for having broken their parole at Camp Perry: they were sent to Brothers Island for the remainder of the term of ten days after leaving Jacksonville. This proceeding was wholly unwarranted and unnecessary, as it was simply impossible for yellow-fever to spread from them in New York at that time. Other symptoms of panic were manifested at other places where they were wholly out of danger, the health authorities in some of the places not realizing the difference between the sanitary treatment of yellow-fever and that of small-pox. Baltimore and Louisville form

notable exceptions; and although a number of deaths occurred at the latter city from refugees from Decatur, Alabama, there was no spread of the disease. On September 24 a refugee from Decatur reached Rockford, Illinois, the patient dying on the 29th, with no spread of the disease. On the 25th a refugee from Decatur arrived at Mt. Carmel, Illinois, the patient recovering without spread of the disease. Hundreds of instances of a like character were to be found in the state in people who had left Florida much earlier, without being sick, or spreading disease in the localities in which they temporarily resided. In this connection I would state that not a single case occurred in the state of Tennessee during the season. In fact, all the quarantines and other precautions taken north of the southern boundary of that state after the 15th of September were wholly unnecessary.

On the 22d I learned that Cairo had established quarantine, notwithstanding my protest, and immediately set out for that place, telegraphing the mayor of Cairo from Harrisburg, and asking for a reply at Altoona *en route*. Apparently this request was misunderstood, and I first read the reply in a Chicago paper on the 23d. I again telegraphed, "Do not interfere with through passengers. Opinion as to necessity for quarantine unchanged. Will be at Cairo in the morning." Passing through Anna on the morning of the 24th, I counselled the authorities at that place against enforcing any quarantine restrictions, and on arriving in Cairo found a public sentiment so closely bordering upon panic that it was obvious the authorities had established quarantine mainly on that account. Meanwhile, there was no yellow-fever nearer than Decatur, Alabama, 258 miles, and Jackson, Mississippi, 367 miles, both of which places were completely isolated and in charge of experienced yellow-fever experts and sanitarians, and the intervening distance covered by numerous "shotgun quarantines." The mean temperature on the day of my arrival was only 64°, and the next day fell to 63°. The danger line had long since passed away from Cairo. At that time it was a physical impossibility for any number of refugees to have caused a case of yellow-fever among the citizens. The sanitary question had, in fact, never attained any importance, and my visit to Cairo was less in the interest of the public health, which was not endangered, than in the interests of business threatened by the abuse of quarantine.

I urged these considerations upon the attention of the authorities and prominent residents, and on the morning of the 25th addressed the members of the local board of health to the same purpose. The board of county commissioners of Pulaski county, Illinois, presented an application, calling upon the state board to take immediate action for the enforcement of quarantine against Southern travellers entering that county. The application was, of course, refused, for the reasons assigned, and during the day there were indications of returning confidence and abatement of the unreasoning alarm. In the afternoon I went up to Anna and Cobden, and caused the quarantine restrictions to be abandoned at those points as well as at Mound City.

Unfortunately, at this juncture there was received the report of a suspicious case at Memphis; and although it was soon proved to be unfounded, it served to renew the alarm and prolong the restrictions. Referring to this case, I think it proper to call attention to the courageous and conscientious discharge of his duty by Dr. G. B. Thornton, president of the Memphis Board of Health, and member of the State Board of Health of Tennessee. The circumstances of the Binford case were such as to warrant its being designated a "suspicious case," and, in accordance with his obligation to the members of the sanitary council of the Mississippi valley and the health authorities of other states, he promptly notified them to that effect. The necessary precautions were taken in the locality, the case was isolated and put under observation, and when, within twenty-four hours after the first report, it was announced not to be yellow-fever, implicit credence was given to the statement. So long as Dr. Thornton shall continue in his present official capacity the people of the Mississippi valley will feel assured that they have nothing to dread from concealment as to the sanitary status of Memphis. With such sanitarians in general control, public confidence during an epidemic would not be so readily disturbed, panics would be prevented, and unnecessary quarantines avoided. Distrust, and dread that the facts are being concealed, add greatly to the complications of every epidemic.

Before the close of the month all restrictions on travel and traffic in Illinois had been removed, and the irresponsible, unwarranted, and illegal quarantines throughout the valley had been abandoned or materially modified.

This is hardly the proper time or place in which to discuss the lesson of the epidemic scarcely yet closed. The medical press of the country is asking, "Who is responsible for the failure to stamp out the disease in the early spring, when it was well known that it had survived the winter on the soil of Florida, and, with the recurrence of warm weather, was certain to become epidemic, if any reliance could be placed upon previous experience?" The public is asking, "Is there no method by which the unnecessary hardships, the paralysis of commerce and industry, and the general demoralization, which have been witnessed again this season after an interval of ten years, can be prevented?"

The national congress, which has just adjourned, has again shown its inability, or its indisposition, to deal broadly and intelligently with the subject. The offer of a prize of $100,000 for a "sure cure" for yellow-fever, and the proposal to establish permanent camps of refuge remote from the yellow-fever district at a cost of $500,000, are equally unworthy of serious consideration. They are based upon the assumption of an indefinite epidemic recurrence of the disease; they ignore the resources of sanitary science and preventive medicine; they traverse the wise old adage concerning the relative values of prevention and cure, and do not seem to appreciate that the prevention of the introduction of the disease into this country will obviate the necessity for these refuge stations.

Yellow-fever is an exotic disease, as incapable of direct origin in this country as is Asiatic cholera. Its poison may, under exceptional conditions, survive the mild winter of the Gulf littoral; but, as a rule, epidemics of yellow-fever in the United States are the result of new and repeated importations of the poison from abroad. Its epidemic appearance has always been in direct ratio to the freedom and extent of our commercial intercourse with the West Indies and the Spanish Main. Thus, for a period of nearly thirty years, ending in 1791, the country was substantially exempt from yellow-fever, an exemption due to the suspension of direct commerce with the West Indies through the enforcement of the colonial acts by Great Britain.[1] After the Declaration of Independence, commerce with the West Indies and the Spanish Main was gradually reëstablished, and in 1791 began the yellow-fever epoch of quarantine following the increasing ravages of the pestilence in the principal seaports of the country.

An obvious inference is, that yellow-fever may be excluded from this country by a judicious system of maritime and port sanitation, founded upon actual knowledge of the yellow-fever poison through its manifestations and characteristics.

Concerning these manifestations and characteristics, we know that, whatever the specific particulate cause may be, it is capable of growth and reproduction; that it is transportable only by adhesion to the surface of articles, or by the air from an infected locality confined in otherwise empty compartments; that it is a ponderable cause, seeking low levels; volatile, in the sense of being dissipated in freely-moving currents of air, but not in the sense of a capability of being carried in the atmosphere to any distance with retention of its morbific potency. We know that a temperature of less than 32° F. will destroy the poison outright, and that it requires a continuous temperature of over 70° for its epidemic propagation and diffusion. We know that the higher the temperature, other favoring conditions being equal, the more rapid and widespread will be its epidemic diffusion, and the graver the character of the disease it produces. We also know that certain methods of disinfection will destroy the poison artificially, and that it is destroyed naturally by aeration; and that its growth and reproduction are connected with the presence of filth in the sanitary sense of that word, including decaying organic matter and defective ventilation.[2]

It is true that this knowledge is not exhaustive, but it is sufficient for the basis of rational and successful methods for the exclusion of the yellow-fever poison from the country; for the control and suppression of yellow-fever epidemics when they occur; and for the prevention of

[1] Coast Defences Against Asiatic Cholera: Report of an Inspection of the Atlantic and Gulf Quarantines. By John H. Rauch, M. D., Springfield, Ill., 1886.

[2] Circular No. 5—National Board of Health, July 12, 1879. Dr. John H. Rauch—"Memorandum for a Classification of Articles of Freight for Quarantine Purposes," Proc. San. Council of the Mississippi Valley, 1881. Prof. August Hirsch—Handbook of Geographical and Historical Pathology, 1883. Prof. Joseph Jones—Article "Yellow-Fever," Quain's Dictionary of Medicine, 1884. Prof. S. M. Bemiss—Article "Yellow-Fever," Pepper's System of Medicine, 1885.

panic, with its consequent demoralization, human suffering, and material losses. To enforce such methods requires the intelligent action of municipal health authorities, aided and directed by the broader power of the commonwealth exerted through an efficient state board of health, the state boards coöperating with each other through voluntary conferences or other form of organization, and the whole compacted, reinforced, assisted, and advised by a national health service commensurate with the vital interests involved. Both personally and officially, my views on this subject are matters of record.

For several years I have urged the creation of a state board of health in Florida, and have furnished documents and papers and other information for use at every session of the legislature for five or six years. Two years ago the president of the Illinois State Board of Health, Dr. W. A. Haskell, while visiting the peninsula, lost no opportunity of personally appealing to members of the profession and to legislators to the same end. The large influx of Northern capital, the growing popularity of the region as a health resort, and the increased facilities of communication, all combine to add to the importance of necessary agencies for the protection of the public health in a region so much exposed by its geographical position to the invasion of the tropical pestilence.

The effect of a competent state health authority in Florida would have been to prevent the policy of suppression and concealment of facts last year by the local authorities, and proper efforts would have been made to stamp out the infection, and to secure a thorough sanitation of the region during the winter, such as was effected after the epidemic of 1879 in the localities visited by yellow-fever in the Mississippi valley. In time such an authority would secure a system of sanitary quarantine which would guard the Florida ports as effectually as the Louisiana State Board of Health now guards the delta of the Mississippi. In fact, with a state board of health in Florida, aided by a properly constituted and sustained national health board, we would have had no yellow-fever in the South during the past year.

The Florida epidemic of 1888 will not be without its compensation if its lessons are utilized to hasten the adoption of such a system of sanitary defences as will give us protection without the evils of unnecessary quarantines, not for any single state, but for the whole country; and not against yellow-fever only, but against all preventable disease, whether of domestic or of foreign origin.

XVIII.

GARBAGE FURNACES AND THE DESTRUCTION OF ORGANIC MATTER BY FIRE.

By S. S. KILVINGTON, M. D., President of the Board of Health.
Minneapolis, Minn.

The growth of great cities is the predominant feature of modern civilization. A necessary concomitant of their growth is the accumulation, in vast quantities and within their limited area, of the refuse of animal life and the products of animal death.

One of the most urgent problems, then, of municipal management, at the present day, is that of the sanitary disposal of waste material. And the very rapidity of our urban development has left us far behind the average progress of our times in the solution of this difficult problem.

When cities were simply adult villages, few and far between, with their sparse population scattered over wide reaches of land, the question of the disposition of refuse could, if not with entire wisdom, at least with comparative safety, be left to take care of itself. Burial sufficed then to rid the living of their dead, or to hide the *débris* with which men and animals overlaid the surface of the earth. Slow growth and unlimited space gave time and room for the slow action of those chemic forces of the soil which decompose and disinfect its organic contents.

But with the appearance of great cities—the birth of an ardent and pregnant civilization—which spring, like the ancient Titan, full grown from the bowels of the earth, this question takes on a new aspect. Amid dense populations and closely crowded dwellings the operation of Nature's laboratory become injuriously tedious. We cling to the old crude methods of waste disposal, or permit the accumulation of animal and vegetable deposits in the vicinity of our homes, only to find that the chemistry of Nature is inadequate for our protection, and that even in the slow steps of her putrefactive processes she develops and introduces into the human economy the germs of disease. Nevertheless, we are slow to learn the lesson of the new order of things, and still we permit the soil and the air and the water about us to be contaminated by human and animal dead; still we heap up, to our own destruction, the offscouring of our stables and our houses; still we poison the pure sources of our water-supply with deposits of carrion, night-soil, garbage, and manure. Future generations, could they unearth the strata of refuse with which our inhabitants of the past half century have overspread the sites of our cities, or turn the rivers from their accustomed courses to view the waste

material with which we have lined the beds of the streams, would surely be justified in denominating this the age of filth-formation.

But, happily, we are beginning to read with profit the lines of hard experience. For fifteen or twenty years the large cities of the Old and New World alike have been casting about for some satisfactory solution of the problem of waste disposal. Throughout this period many expedients have been devised, many new methods have been applied; and, though we are still in the period of experimentation, we are gradually gravitating toward the settlement of this sanitary question.

After all has been said and done in favor of all other means of ridding ourselves of the waste products of city life, history repeats itself in the suggestion of fire as the only competent agency at our command. I say history repeats itself in the suggestion of fire—for ancient civilizations and yet older pagan peoples long since, and again and yet again, arrived at the same sanitary conclusion to which we have come. Cremation of the human body, to say nothing of human waste, was in vogue among all early nations excepting those of Egypt, Judea, and China. It was from the effete civilization of the latter country that Christian peoples derived the insanitary and inhuman practice of earth burial. In a great part of Asia and South America the fire is still employed to destroy the remains of the dead and the refuse of the living. The method was followed by several North American tribes. Even the Israelites burned the bodies of Saul and his sons at Jabesh; the Jews cremated the victims of the plague in the vale of Tophet; and, outside the walls of Jerusalem, they cast their offal, garbage, and dead animals into the unquenchable fire which burned perpetually in the pit of Gehenna, three thousand years ago. Cremation was practised, undoubtedly, among the early Christians, while it was still resorted to by the Swiss in the eighth century.

The destruction of organic waste material by fire is the subject before us for discussion, and you observe that I take license from the breadth of the title bestowed upon my paper to include, incidentally, even the disposal of the dead by this sanitary method; for, though the classification of the remains of the beloved living with the unclean category of other organic and obnoxious materials is shocking to the affectional sense, the consequences of our prevailing custom of interment for those remains in large cities are as injurious as any similar disposition of any other decomposing matter we could make. Cremation must be the final end to which the organic products of human life and the organic products of human death must eventually come.

Sanitarians give no uncertain sound in their spoken recognition of the pressing needs of the situation and of the best method of satisfying those needs. Said Sir Henry Thompson,—"No dead body is ever placed in the soil without contaminating the earth, the air, and the water above and about it."

Said Sir Robert Rawlinson, some four years ago,—"The effectual destruction of refuse, at the least possible expense, is the object which

must be attained." Says a recent issue of the *Sanitary Engineer*,—"Next to pure water, there is nothing more important to a municipality than the satisfactory disposition of its refuse: and the two matters are often closely connected." And the eminent authority of London, to whom I have already referred, adds, in words quoted to this Association by my eminent predecessor upon this subject a year ago,—"All matter liable to putrefaction must be consumed by fire." Nothing, truly, but cremation will accomplish rapidly that which this putrefactive process does so slowly and, in its effects, so disastrously.

Having established the desirability of this destructive agent, we turn from the principle to the practical study of the apparatus by means of which it may be utilized. Open-air destruction of refuse by fire constitutes an intolerable nuisance. It is essential that an enclosed and carefully constructed furnace-chamber should be provided. The search after such a contrivance has been long and persistent, and has led to variably successful results.

As early as 1865 the writer's appreciation of the importance of this question was stimulated, and his first practical ideas of a crematory were begotten, by his study of the furnace constructed at the Rock of Gibraltar for the purpose of disposing of the refuse accumulated by the garrison of that fort. It is believed that this crematory at the citadel on the straits was then the only furnace of the kind in public use.

In the year 1870, a firm of contractors in Paddington, England, attempted the design of a refuse destructor, which, when put in practical operation, proved a conspicuous failure. A few years later, Whiley, of Manchester, attempted a somewhat similar structure, with little better results. About 1875, the city of Manchester undertook to build a group of eight destructor furnaces. In contrast with the patents of later days they are crude in design, unsatisfactory in operation, and expensive to support. Each furnace consumes less than five tons of material in twenty-four hours, and the entire plant employs not less than five men. Between 1881 and 1883, several Yorkshire towns became interested in the problem of garbage destruction by fire, and the attention thus drawn to the subject by these and other cities led, in the five years following, to the issuance of a group of patents and the construction of as many garbage or refuse furnaces by a half dozen inventors.

As early as 1877, the city of Birmingham adopted the Fryer patent, a costly invention, so clumsily adapted to the purpose that it was speedily abandoned on sanitary grounds. In 1881, the same furnace was remodelled, and operated more successfully in Birmingham. About the same time was built at Byker, near Newcastle, in England, a Fryer crematory which cost the remarkable sum of $33,880. A little later the Healey Patent Destructor was introduced in Bradford, England, and was built upon a plan which has since been followed and improved by other inventors. About the same period, the Wilkinson furnace superseded in effectiveness, without actually displacing, the Fryer patent at Birmingham and was erected also in the town of Blackpool. In 1885, Mr. Stafford,

of Burnley, built his first Bee-hive Destructor at Richmond, England. Coincidently a crematory, upon the Hickey model, was put up at Bengal, India, while another bee-hive furnace was erected in Bombay. In this year, Richmond and Co., of Burnley, introduced the "Nelson Town's Refuse Destroyer." Messrs. Hewes, Hewes & Geary also built a crematory in Leicestershire, England, for the treatment of sewage sludge, and, at the same time the great Glasgow plant, to which we shall again have occasion to refer, was constructed. At this date, the evolution of a model refuse crematory seems to have reached a pause in its progress in Great Britain, to have passed over to the hither side of the Atlantic where the superior inventiveness and mechanical ingenuity of the American mind have brought it, within three years, to a point of perfection, coupled with a degree of simplicity in construction and economy of cost, which completely discount the more ponderous scientific efforts of our British brethren.

In 1885, Lieutenant Reilly, of the United States army, constructed for the United States post at Governor's Island, New York harbor, a miniature crematory, for the destruction of the refuse of the post, which proved to be the archetype of American furnaces. In the same year the Pittsburgh gas companies offered the free use of natural gas to their city for the destruction of its refuse, and a small garbage furnace was built at Allegheny City, costing $1,500, in which this agent was used for fuel. Soon after our Canadian brethren took an active part in the solution of the problem, and Mr. William Mann, whose admirable crematory was so fully described to us at the last annual meeting of the Association by Dr. Laberge, the efficient health officer of Montreal, undertook the destruction of the night-soil of Montreal at a cost of $8,000 per year to the city, while a year later he took the larger contract for burning its miscellaneous refuse for the sum of $43,000 per annum.

One after another, in the three succeeding years, came the establishment of crematories in the cities of the United States. First, the Bartlett furnace, a small crematory for use at Johns Hopkins hospital, in Baltimore, was built. Then came the erection of the first crematory of the Engle patent at Des Moines, Ia., followed by the introduction of small furnaces upon this model in some of the college buildings of that state. At the close of 1886, the Forristal furnace was opened in Milwaukee. In 1887, Mr. M. F. Smith demonstrated the operation of a gas furnace in Pittsburgh which would consume night-soil and garbage in an astonishingly short space of time, but which seems to have been lacking in the essentials of sanitary protection. Within the same year, Pittsburgh witnessed the erection of the Rider garbage furnace and Chicago selected the William Mann patent for its municipal use. In 1888, Detroit adopted the Glasgow plant, while Buffalo adopted the Murtz system of disposing of a certain class of refuse, from which oil is extracted, and the residue of which is used as a fertilizer. And finally Minneapolis, which I have the honor to represent, came to the front in the adoption, with improvements, of the Engle patent; and her

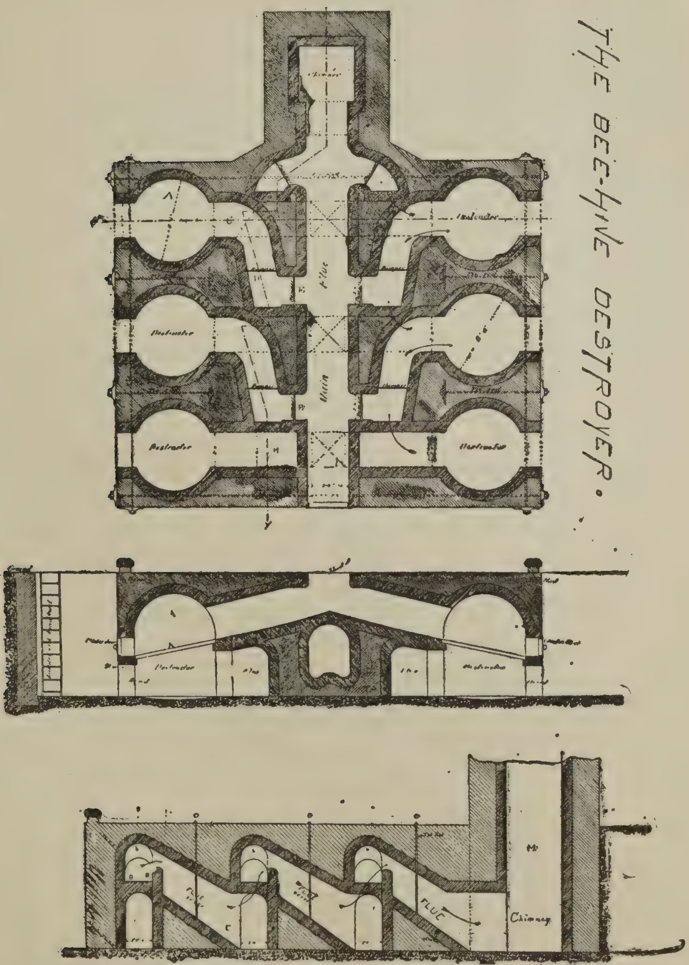
example, I am happy to say, has been followed by the cities of Milwaukee and Coney Island in the choice of the model of the Minneapolis plant, which, in practical operation, we shall have an opportunity to present to you.

Other cities of prominence are carefully investigating the question of refuse destruction and are studying the different patents which offer themselves to the public.

It becomes of present and overshadowing importance, as we bring this history of the evolution of the crematory up to our own immediate day, to determine the relative merits of these patents; and, in order that this may be intelligently done, we should entertain clearly the qualities which they must necessarily possess for the fulfilment of metropolitan needs. A furnace, moderate in its cost of construction, economical in its needs of fuel, demanding a minimum of labor in its conduct, adapted to the varieties of waste material to be consumed, approximating a perfect and rapid destruction of such material, with practical freedom from all occasion of nuisance in the way of excess of smoke, the disposition of refuse, or the formation of noxious gases or offensive odors, and affording a product which will, at small cost of handling, prove remunerative and available for fertilizing or mechanical uses,—this is the practical ideal that we seek.

I shall briefly discuss the leading features of the several patents now in conspicuous use, and endeavor to enable you to form some judgment of the greater or less measure in which they approach to that ideal. Three distinct methods of classification might be adopted,—(1) that which turns upon the adaptation of the crematory to the destruction of certain definite kinds of refuse; (2) that which depends upon the provision for the immediate or the ultimate burning of the material; (3) that which is concerned with the means employed for the destruction of the smoke and offensive gases which result from the combustion of the material. I shall endeavor to assign to each of these patents its proper place under these several heads. Some of them I shall be compelled to pass over with but a few words of mention, either because they are not adapted by the methods of their construction to the needs of American city life, or because they are surpassed both in economy of construction and of operation by the later American models. Among these may be noted the Healey Patent Destructor, built by the Municipal Appliances Company of London. It is designed for the burning of ordinary miscellaneous refuse, and is not adapted to the disposition of night-soil. It is constructed upon the plan of an inclined grate, and belongs, therefore, to the class of furnaces in which the garbage must be dried before descending into the fire. It is one of that class also in which a superheated reverberatory arch is provided over the fire-grate, by means of which it is intended that smoke and noxious gases shall be consumed. The authorities of Bradford, where this furnace is in use, have found, however, that this end is not practically attained, and that the offensive vapor issuing from the chimney flue constitutes a nuisance.

The Fryer furnace is altogether too costly for general adoption. It contains what is called a concretor for the destruction of night-soil and a carbonizer for other refuse. The grate is formed upon the same general model as that of the Healey patent, and the refuse, therefore, is dried and then burned. Its capacity, equally with that of the Wilkinson furnace, which we may also mention in passing, is small, and the cost of operation in both is relatively large. The Hewes, Hewes & Geary plant is a



THE BEE-HIVE DESTROYER.

model of scientific construction, but its operation has not been practically demonstrated in this country. Unlike the furnaces to which we have already referred, whose product is only of value as a factor in the making of mortar, the Hewes, Hewes & Geary crematory produces a high quality of fertilizer, which is secured, however, at a cost too great to make its sale profitable in this part of the country.

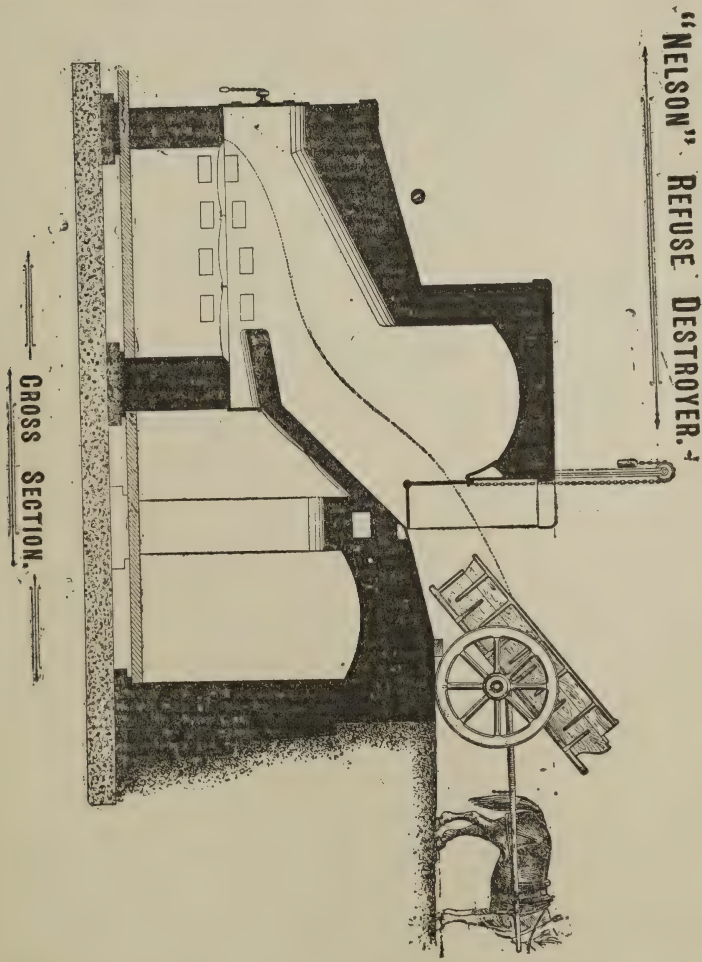
The Glasgow plant is only in a limited sense a crematory. It really constitutes a station for the receipt, sorting, sale and distribution of refuse, collected in a wonderfully systematic way, by the bucket-system, from all parts of the great city it serves. Animal manure and the more valuable kinds of miscellaneous refuse are not cremated at all. The cinders are sorted from the ashes collected and are economically used as fuel to feed the furnace fires, while the finer residue of the same is mixed with night-soil which is thus deodorized. A large quantity of this material is thus disposed of, and the product is mixed with the unburned refuse to form a fertilizer. The forms of refuse that are not available for fertilizing purposes are burned, and the product of their combustion is ground up and used in mortar-making.

The Bee-hive crematory, patented by Mr. Stafford, of Burnley, is perhaps the most prominently and favorably known of any of the English models. As constructed at Richmond, England, it has a furnace in bee-hive form situated upon each side of its chimney shaft. Each bee-hive is six feet in diameter, is built of fire-bricks, and is dividedi nto three parts, vertically, by two tiers of grate bars. Upon the lower rectangular tier of bars the fuel is received, while the refuse is thrown through the openings in the furnace dome upon the upper inclined grate. It belongs, therefore, to that class of furnaces which dry the refuse before burning it, while it carries the gases and smoke of combustion over, through conducting flues, from one Bee-hive furnace to the other, passing the same over the fire and measurably consuming them. It is used for the destruction of garbage and miscellaneous refuse, and has a capacity of some fifteen tons a day. But a slight odor is discoverable in the smoke and vapor issuing from its chimney shaft. The product of combustion is slacked and then ground up and used for making mortar. I am fortunate in being provided with illustrations of the Bee-hive crematory.

Closely related to the Beehive in manner of construction, and closely rivalling it in public favor in Great Britain, is the "Nelson Town's Refuse Destroyer." It is built upon the same plan of a group or row of furnaces, connecting with each other. These furnaces, excepting the one nearest to the chimney-shaft, are employed in the indirect consumption of all kinds of refuse, including ashes, garbage, and human and animal excreta. An inclined grate, the upper part of which serves as a drying hearth, is supplied to each of these furnaces. Upon this the material to be burned is thrown. As it drys, it falls upon and maintains the fire, producing a form of clinker which is constantly raked out by the fireman, thus making room for fresh supplies of unburned refuse. The smoke and gases of combustion are carried from one furnace to its next adjoining neighbor, until they reach the last of the series. Before entering the latter, they are passed through a chamber partly filled with water upon which a thin film of petroleum is kept burning; and, finally, they are conducted into the last furnace which is supplied with a coke fire, which completely consumes the remaining smoke and gases, but is not used for the destruction of the raw refuse material. The chimney-shaft

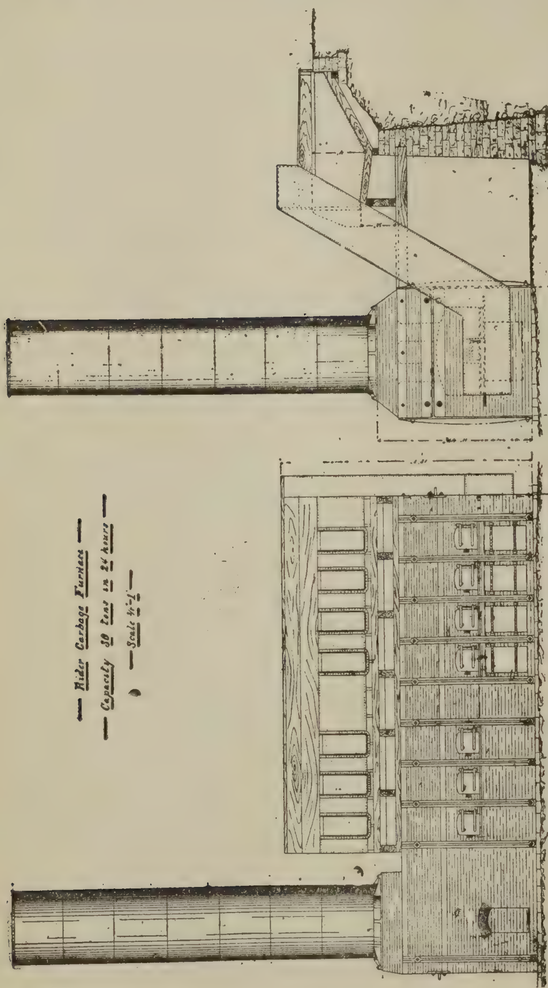
is but moderately high. This destructor is said to be entirely free from any suspicion of nuisance, to be economical in cost of construction and in cost of operation, requiring the services of but one man, and affording sufficient heat to generate steam from a boiler for mechanical uses.

With pleasure I turn to the fuller descriptions, which I am able to afford, of the four principal crematories which have been in use during the last three years in the United States and Canada.



The Forristal furnace, which has been operated until recently in the city of Milwaukee, consists of a two-story building. Teams drive into this building and dump their loads into a hopper, whence it is carried by elevators into the drying-room above. Here it is treated by steam heat, and liquid residue is drained off. It is then shovelled through a tubular chute to the floor below, where it is deposited in

front of the furnace doors. Thence it is shovelled into the fire and kept constantly stirred. The fire itself is operated upon the principle of a blacksmith's forge, with the aid of a blast fan. The latter, together with the refuse elevators, is run by a small steam-engine, which also furnishes steam for the drying-room. The furnace is of brick, with a square form and an arched top. It maintains a single fire, which is relighted every day. A single row of doors upon each side of the furnace serves for the admission of fuel, for the supply of refuse and for the work of stirring or stoking the fire. Smoke and gases are carried out directly into the chimney shaft. An engineer and four laborers are required to run the plant. To sum up, the Forristal crematory is designed for the destruction of miscellaneous refuse; it is not adapted to the disposal of night-soil; it has a single fire which directly consumes the waste material, but it has no special provision for destroying smoke and gases.



The Rider garbage-furnace is, as we have already said, in use in the city of Pittsburgh. It has been largely used in that city for the destruction of spent tan-bark, and has performed this task, as also that of the destruction of garbage, to the apparent satisfaction of its owners and the public. Its construction seems to require the primary investment of a large sum, but its patentee claims, as one of its most desirable features, great economy in the expenditure of fuel. It is said to require an amount of fuel equal to less than five per cent. of the material cremated, this being used as an initial supply to bring all parts of the furnace to a proper temperature, after

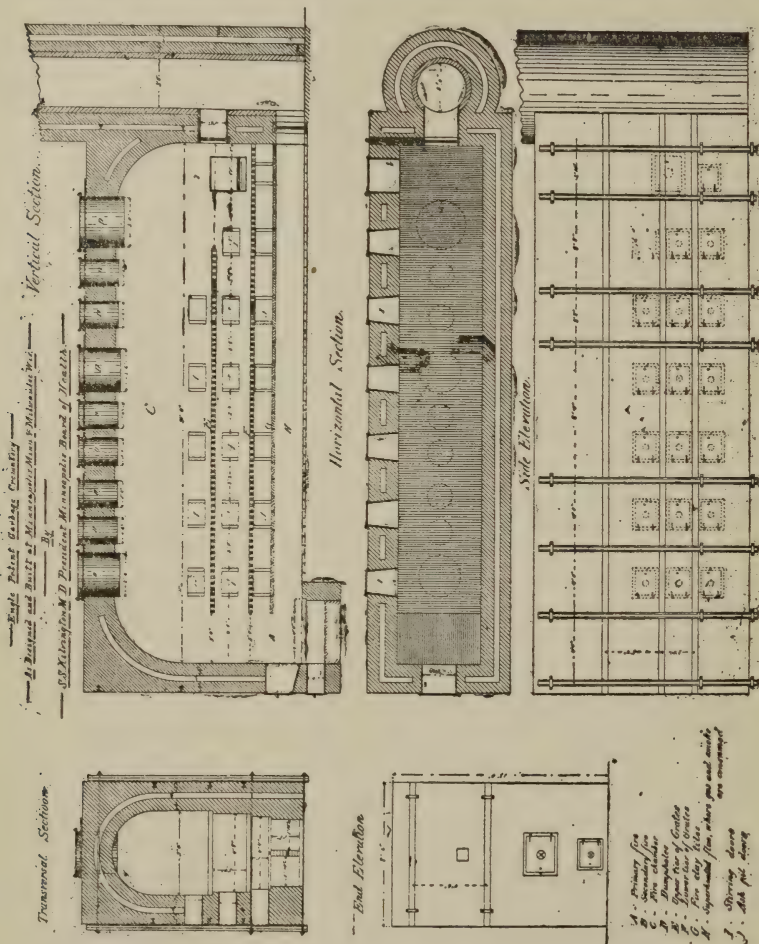
which it is claimed that the garbage itself, if furnished in sufficient quantity, will provide all the fuel necessary to maintain its operation. It is needless to say that this must depend, in any furnace, upon the degree of combustibility of the refuse matter discharged into it, as also upon the disposition which is made, throughout the whole extent of the furnace, of these fuel-forming materials.

The Rider furnace is of an elongated form. It consists of a front chamber 12½ feet in length by 6 feet 5 inches in width. This chamber is surmounted by a dome in which are eight circular openings 15 inches in diameter. In the rear of this is another chamber, 9½ feet in length by the same width, which is floored with a tile hearth. This is separated from the first chamber by a bridge wall, 3 feet in thickness, and has in its rear a second bridge wall, over which the products of combustion pass to enter the chimney. This second chamber is also surmounted by a dome, in which are six circular openings the same size as the first. The products of complete combustion in this furnace are said to be completely innocuous, while the solid residuum is valuable as a fertilizer. This crematory, then, belongs to that class which can be adapted to the destruction of excreta as well as miscellaneous refuse. It disposes of its supply by immediate and direct combustion, and, although no special means are provided for the consumption of smoke and gaseous products, experience with it up to the present date would indicate its freedom from any objectionable or insanitary features.

After the remarkably complete description of the Mann crematory to which this Association listened a year since, it is hardly necessary that I should go at length into the details of its construction. Like others of its class, it can be adapted in form and size to the location it occupies and the needs of the community it is intended to serve. It shares with the Engle patent the beauty of simplicity of structure. As built in Montreal, where its operation is reported to be very satisfactory, its combustion chamber is quadrilateral, with dimensions 16 feet plus long by 9 feet broad and 10 feet high. This is fitted with a grate, of approximately the same dimensions, which is laid with a slight incline upward in the direction of the chimney flue. At the lower end of this grate is its single fireplace. It has upon each side of it three tiers of three doors each; the upper tiers are at the level of a staging floor, upon which the loaded refuse carts are driven, the refuse being emptied directly into the furnace through these doors, or placed upon the floor in front of them. The second tier of openings is situated just above the line of the grate, and these are used for stirring the fire. The lowest tier is at the level of the ash-pit, and gives opportunity for the removal of the ashes. The grate bars are laid two inches apart.

In Montreal two forms of the Mann furnace are in operation,—one for the destruction of miscellaneous refuse, the other for the burning of night-soil. There, as in Chicago, where the same furnace is used, the smoke emitted has not amounted to a nuisance nor has any perceptible odor been noticed from either, excepting during the cremation of chicken feathers.

In conclusion, let me invite your attention briefly to the only remaining patent left for our discussion—the Engle crematory, an invention which has demonstrated, or is demonstrating, its own success in the cities of Minneapolis, Des Moines, and Milwaukee. As constructed in the city of Minneapolis and duplicated here in the city of Milwaukee, we have an elongated arch furnace; its cremating chamber is 33 feet



long by 5 feet wide. It has a height of arch, from the grate to the dome, of 7 feet clear.

As shown in the accompanying cut, representing a vertical longitudinal section of the structure, at the end of the grate nearest to the chimney flues, but not in connection therewith, is the primary fireplace. Beneath the grate, throughout the whole length, is an elongated ash-pit, which is floored with fire-clay tiles and which forms the roof of a superheated smoke flue, which I shall presently describe. At the end of the

furnace most remote from the chimney shaft is a fire-grate, four feet below the level of the first, upon which a secondary fire burns. Between this and the chimney shaft runs the long horizontal smoke flue to which I have already referred, with its superheated tiled roof, continuing for a length of 28 feet to the chimney shaft, which rises 100 feet in height. The building in which the furnace is enclosed is of three stories. At the level of the first floor is a double row of doors, the upper of which gives opportunity for feeding the primary fire and for stoking the burning material, while the lower row opens into the ash-pit and permits the removal of ashes. At the farther end of the furnace, upon this same floor, are doors for supplying the secondary fire and removing any ashes it may produce. The second floor is at the level of the top of the brick furnace, and upon this floor are delivered the bodies of dead animals, which, by means of pulley attachments, are lowered through a large tubular shaft rising to the level of this story and discharging into the furnace at a point near the primary fire. To the level of the third story rise from the furnace dome three tubular shafts, 15 feet in length, into which the miscellaneous refuse wagons immediately discharge their contents from the upper floor, upon which they drive.

Preparatory to the operation of the furnace the fires are started in the primary and secondary fireplaces and are maintained until a sufficient degree of heat prevails throughout the furnace and in the superheating flue beneath the ash-pit. I have already emphasized the fact that animals are discharged into the furnace nearest to the primary fire, while other miscellaneous material is distributed through the small tubular flues along the remoter portions of the grate. This arrangement contributes, to the aid of the primary fire, the best fuel-forming materials to be burned first, thus diminishing the amount of fuel required to maintain the action of the furnace. The products of combustion are carried over the grate and thence over the secondary fire, burning at a lower level at the opposite end, and are there consumed; thence any small amount of remaining smoke or gas is carried along through the superheated horizontal flue, undergoing further combustion, until the chimney shaft is reached; the ashes or the *débris*, falling through the bars of the grate, light upon the fire-tiled floor of the ash-pit, where they are again consumed; while liquids, dropping upon it, are instantly evaporated; thereupon, also, final ashes are deposited. The arrangement by which the scavengers dump directly into the flues minimizes labor and insures greater cleanliness.

Among the questions likely to be asked under this topic is that which relates to the primary cost of construction. Definite answers to this query cannot be given, for the reason that, with any one of the furnaces we have described, cost must depend very largely upon location, availability of materials, command of skilled labor, and the size and capacity of the furnace which the circumstances and extent of the population demand. Equally important is the question of the cost of operation. This, again, is insusceptible of a definite reply. Location, available fuel sup-

ply, economical management of the furnace fires, the class of garbage or refuse to be burned, and the proper disposition of fuel-forming materials,—these are all considerations which largely affect the question of working cost. The Mann furnace in Montreal is said to be operated at a cost of twenty-five cents per ton of miscellaneous refuse, and of seventy-five cents per ton of night-soil. It is claimed that the Rider furnace will do about the same thing.

An estimate of the expenses of operating the Engle crematory in Minneapolis for a period of five days, during which the furnace was worked by three men entirely new to the task, two of whom were on duty by day and one by night, gives the following facts and figures:

Consumed in five days,—33 horses, 59 dogs, 103 barrels of hotel and commission-house refuse, 12 loads of market offal, and 70 loads of manure, weighing in all over 200 tons. Total cost of labor and fuel for this period, $38.25, or $7.65 per day,—the entire weight of refuse being destroyed at a cost of 19 cents per ton. The ash deposited in the course of the consumption of this material is exceedingly small in quantity, weighing less than two hundred pounds per day.

This estimate, eminently satisfactory as it is, is not altogether a fair one. The men employed were wholly inexperienced. The furnace, at the beginning of these five days, was cold, and it required several hours to superheat it. The fuel used was simply lath edgings and coal screenings, or "breeze." The glut of horses was unusual and crowded out the ordinary supply of garbage. It is safe to say that upon an average run, over an extended period, fifteen to twenty cents per ton of refuse would pay for the labor employed and the fuel consumed.

So far, then, as a brief period of time has permitted careful observation, the principal American crematories may be said to have demonstrated their fitness for the task of waste destruction. The possibility of burning the refuse materials of a great city, without imposing upon its people a penalty of insanitary consequences in the performance of the act, has been established beyond the shadow of a doubt. Nuisance is far more apt to arise from mismanagement in the handling of the material to be burned, than it is likely to ensue from the products of cremation. The odor which arises from the direct burning of night-soil, even without any special precaution for the consumption of gases formed, is not so obnoxious as might be imagined, resembling the smell of burned leather. The commercial value of the solid residue of combustion has yet to be tested. It will vary, of course, according to the method of cremation. The innocuous character of the ash must be demonstrated in each individual case.

The only analysis of this material, as produced by the Minneapolis crematory, that I have had an opportunity to obtain, has been made within a few days past by Professor James A. Dodge, Professor of Chemistry in the Minnesota State University. The sample which he examined was selected in small quantities from different parts of the ash-pit, but it was taken therefrom within a few hours of the initial starting

of the furnace, and before the ash-pit had become thoroughly superheated. Consequently it may be assumed that it contains some proportion of organic matter which would be consumed under more average circumstances.

The following is the report of the analysis made to me by Professor Dodge:

Dr. S. S. Kilvington, President of the Minneapolis Board of Health:

SIR: I hereby report to you the results of my analysis of a sample of *ashes* lately received from you.

Moisture,	2.82	per cent.
Organic matter,	10.68	"
Sand and clay,	49.19	"
Sodium chloride,	2.83	"
Iron,	1.96	"
Lime, CaO,	10.26	"
Magnesia, MgO,	.78	"
Potassa, K_2O,	2.68	"
Soda, Na_2O,	2.57	"
Anhydrous phosphoric acid, P_2O_5,	8.16	"
Anhydrous carbonic acid, CO_2,	1.49	"
Soluble silica, SO_2,	1.24	"
Sulphur in sulphates and sulphides,	1.59	"
Oxygen, combined with part of the iron and part of the sulphur, and loss,	3.75	"
	100.00	"

I append the following notes on the foregoing analysis:

The organic matter is partly unburned carbon and partly nitrogenous matter, communicating considerable odor to the ashes. The iron is probably mostly in the state of oxide of iron, but partly in the state of sulphide of iron. The latter gives some odor. The lime and magnesia are mostly combined with the phosphoric acid, making about eighteen per cent. of phosphates of lime and magnesia.

The potassa is mostly combined with carbonic acid. The soda is probably combined partly with carbonic acid. The silica is probably combined with soda and some potassa. The sulphur probably exists mostly in sulphate of lime. The precise manner and proportion in which the above bases and acids are combined cannot be determined.

Very respectfully yours,

JAMES A. DODGE,
Professor of Chemistry.

It will be seen that this ash contains many constituent elements which make it of some value as a fertilizer. The product of any such furnace, employed in the destruction of animal and vegetable refuse, would be enhanced in value by the admixture of the product of a night-soil crematory. This fact is illustrated by the management of the Glasgow plant. I have at hand samples of the ash of the Engle crematory at Minneapolis, which I shall be happy to submit either to the olfactory organs or to the chemical retorts of the members.

After the most minute description of the several crematory patents that the limits of such a paper as this will permit has been made, the choice of a furnace remains a difficult one. It lies unquestionably, for American cities, between the Rider, the Nelson, and the Engle patents. Each of these has its features of advantage. After a careful study of the subject, Minneapolis and Milwaukee have, as you are aware, deter-

mined upon the Engle crematory, with certain modifications. And after a careful selection has been made, an equally important duty remains. A furnace should never be built from mere designs or drawings, or even under the charge of an ordinary architect or builder. The supervision of the work by a specially trained person should be secured, or it will inevitably follow that mistakes will be made and money foolishly expended.

But I must hasten to a close. The summation of facts I have had the pleasure to lay before you must give to every sanitarian among us a sense of self-congratulation that he has fallen upon such a period of progress in this direction and has the opportunity of hastening the steps of this reform. Everywhere interest in the question of cremation is awakening, and the present points to a future—a *near* future—in which every city, large or small, upon the American continent will consider the crematory a necessary part of its municipal outfit; and not only is it given to each of us to look forward to a time when our cities will be redeemed from the curse of accumulating waste, when the rivers will be unpolluted by the sewage which now converts them into common sewers, when the cess-vault and the garbage-pit and the manure heap and even the earth cemetery will be abandoned, when the age of filth-formation will be superseded by the era of filth-destruction, when fire will purify alike the refuse of the living and the remains of the dead,—but also is it allotted to each one of us to help to bring in the coming of this sanitary consummation.

XIX.

SOME OBSERVATIONS ON THE ORIGIN AND SOURCES OF PATHOGENIC BACTERIA.

By THEOBALD SMITH, M. D.,

OF THE BUREAU OF ANIMAL INDUSTRY, DEPARTMENT OF AGRICULTURE,

Washington, D. C.

That all pathogenic micro-organisms have been derived at some time in the past from those living in the soil, water, and decomposing organic matter will be seriously questioned by no one who has paid any attention to them. The marked similarity in form and physiological characters of pathogenic and harmless species strikingly confirms this view. Thus, we have several forms of bacilli which resemble those of Asiatic cholera in most of the features which serve us as means of differentiation. Typhoid-fever bacilli resemble ordinary forms so closely that a diagnosis between them is rendered very difficult. Hog-cholera bacilli cannot be distinguished from many putrefactive forms, except by their peculiar and fatal effect upon experimental animals. Anthrax bacilli differ so slightly from the ubiquitous hay bacilli that Büchner was at one time led to try to transform one into the other, but without success. Not much more than ten years ago Nägeli saw no necessity for separating the various bacteria into distinct species. The morphological monotony which presented itself under the microscope led him to say that "the same species assumes in the course of generations forms unlike both morphologically and physiologically, which in the course of years and decades produce the souring of milk, the formation of butyric acid in *sauerkraut*, the gelatinification of wine, the putrescence of albuminoids, the decomposition of urea, the reddening of foods containing starch, typhoid, relapsing fever, cholera, or intermittent fever."

Such views, if true, would make us totally helpless in our conflict with this microscopic world. If the most harmless can become our deadly enemies in the course of a few years, the problem would be war against all bacteria. But the great majority are indispensable to the great rotation of matter which goes on incessantly between the organic and the inorganic household of nature.

Nägeli's extreme views, happily for us, have very little ground to stand upon. We do not believe that the transformation of harmless into pathogenic forms may take place at any time, or that variation among bacteria goes on constantly within very wide limits. We have learned that there is a marked fixity of characters in these simplest forms, which

seems the more remarkable the longer we devote ourselves to their study. This fixity has very likely been reached by a gradual adaptation to special conditions extending over very long periods of time. As a necessary consequence of this adaptation there are bacteria corresponding to various grades and forms of parasitism, ranging from those which produce disease only incidentally to those which cannot subsist excepting in the animal body. We now know of bacteria, such as the cholera spirilla, which can only live outside of the body itself in the alimentary tract, and poison the organism with the products of their metabolism; and we know of bacteria, such as the bacilli of tuberculosis and leprosy, which have adopted, perhaps, the most complete parasitic habit, an existence within the protoplasm of the cell body itself.

Granted a marked fixity of physiological characters and a scale of forms corresponding to different degrees of parasitism, we cannot evade the inference that there must be going on even now imperceptible changes in the characters of some bacteria, and hence of diseases caused by them. The question may then be asked, Have we any evidence in history of the changes in the nature of prevailing diseases, or of the appearance of new ones? This could only be approached by a careful study of infectious diseases, and the epidemics they have caused from antiquity up to the present. Even if I were sufficiently familiar with the literature of this subject, I doubt whether much could be gained by such a study, owing to the doubtful value of the testimony of medical history. Have we not witnessed, as late as our day, the confounding of one disease with another, because nothing was known of their etiology? It is not very long ago that typhus, typhoid, and relapsing fever were looked upon as one disease. Now we know that typhoid and relapsing fever are due to very different organisms; and as to typhus, we are aware of its claim to a separate place in the list of maladies, although its etiology is still unknown. Scarcely a decade ago all swine diseases were one. Now, this one disease turns out to be three, caused by readily distinguishable microbes. These illustrations will suffice to show that the history of medicine cannot be relied upon to help us in tracing any changes which the same disease may have undergone, or in heralding the presence of a new disease during centuries and tens of centuries. The problem is still more complicated by the fact that epidemic diseases have frequently come from unknown quarters of the globe.

There are a few indications, however, which point to variations in the severity and character of some infectious diseases. The Black Death of the fourteenth century manifested a character somewhat different from that of the Oriental plague, with which it has been in general identified. Liebermeister states that typhoid fever has become modified in severity since the beginning of this century. It is believed that Asiatic cholera may have developed its endemic character not before the last century, having been a sporadic disease before that time, like the *cholera nostras* of European nations. Only during the present century has it invaded Europe as an epidemic disease. Attention has been called in Germany

to the recent development of an epidemic character in cerebro-spinal meningitis. We may not be far from the truth, therefore, when we assume that there is a birth, change, and decay of diseases due to very gradual changes in the micro-organisms which are the causes. In weighing evidence of this kind, however, we must not lose sight of another factor—the varying power of resistance presented by individuals and races under different internal and external conditions to the same micro-organism.

When we pass to present bacteriological researches, we obtain some positive facts concerning the variation of pathogenic bacteria within narrow limits. We have become familiar with the conception of variability through the persistent successful labors of Pasteur. He has taught us that anthrax bacilli can be attenuated by heat so as to form physiological varieties. This change is, no doubt, a degeneration on the part of the bacilli needing no comment, for it is the common heritage of all organisms to degenerate. But to cause an increase of pathogenic activity is an important and striking fact, not only in biology, but in epidemiology. Pasteur succeeded in increasing the virulence of *rouget* bacilli by passing them through a series of pigeons, *i. e.*, inoculating each with the blood of the one preceding in the series. The bacilli obtained from the last of the series were more fatal to swine than those obtained directly from the latter animal. We may draw upon his investigations of rabies for another valuable illustration in variability. In commencing to inoculate a series of rabbits beneath the dura with the virus of rabies from the streets, the animals lived about fifteen days. From the spinal cords of these a second pair were inoculated, from the second a third, and so on. Later on in the series, the duration of the disease fell from fifteen to twelve, eleven, nine, and eight days. After the eightieth to the one hundredth passage it was shortened to seven days. It remained at seven days after the one hundred and thirty-third passage, rarely falling to six.

Gamaleia, in a recent communication to the French Academy of Sciences, claims to have found a method of augmenting the virulence of cholera spirilla. After passing the germs through a guinea-pig, he inoculates a pigeon, which dies of a "dry cholera," with exfoliation of the intestinal epithelium. The germ appears in the blood, and after several successive inoculations it acquires such a virulence that one or two drops of blood are sufficient to kill pigeons in from eight to twelve hours; guinea-pigs are likewise destroyed by the inoculation of very small quantities. If we bear in mind that guinea-pigs could only be infected by Koch through the stomach made strongly alkaline, and that the comma bacilli did not appear in the blood, the experimental results obtained by Gamaleia are certainly very remarkable. The same observer came to very interesting conclusions of a similar bearing concerning the microbe of fowl cholera. It is well known among bacteriologists that a certain number of animal diseases, such as fowl cholera, rabbit septicæmia, swine plague, and an infectious disease among game, which has been described in Germany under the name of *Wildseuche*, are caused

by what is supposed to be the same micro-organism under different conditions. Just what these conditions are, whether depending on variations in the germ itself, or in the infected animals, or both, it is impossible to state. I have encountered this same organism as a saprophyte in the nasal mucus of healthy swine, as well as the cause of a fatal infectious pneumonia in the same species. I have found it in a few cases of interstitial pneumonia in cattle and in diseased rabbits. In these different situations it presented minor physiological variations, the most important of which had reference to its sensitiveness to temperature while multiplying, and its pathogenic activity when tested upon the same species of animal, as, for example, the rabbit. Gamaleia found this same species of organisms as ordinary inhabitants of the digestive tract of pigeons. By passing them through several rabbits in succession, they became virulent enough to prove fatal to pigeons and fowls after inoculation.

Besides this physiological modification of bacteria produced experimentally in the laboratory, by which their pathogenic effect is augmented, we are frequently brought face to face with modifications going on in nature. Several years ago I pointed out certain minor differences between hog-cholera bacilli from two different localities. In culture liquids one variety always formed a surface membrane; the other, not. This tendency was not lost or changed, even after the germ had been passed through a series of animals. The same variety was also more sensitive to the reaction of the solid media employed. So far as pathogenic activity was concerned, they were the same. The production of coagulation-necrosis in the liver of mice and rabbits, peculiar to hog-cholera bacilli, was common to both.

But differences in form and growth upon artificial media are less common than sameness of form and growth combined with a difference in virulence. Thus, I have had occasion to observe in the study of infectious pneumonia in swine, that the germ of one epizootic, when introduced beneath the skin of rabbits, caused a septicæmia fatal in less than twenty-four hours. The bacteria inoculated were present in large numbers in the blood and spleen. In another epizootic, the germ was incapable of destroying rabbits in less than from three to eight days. Instead of a true septicæmia, there would be an extensive sanguinolent, gelatinous, or cellular infiltration of the subcutis extending from the point of inoculation, together with a partly cellular, partly fibrinous, exudate in the neighboring abdominal cavity. While the bacteria were very numerous in this exudate, they were nearly absent from the blood and spleen. I have also observed a difference in the virulence of glanders bacilli as manifested in inoculated guinea-pigs. In many the disease lasted three or four weeks, accompanied by swelling of the limbs, suppuration of the testes, and ulcers on the surface of the body. In one animal, however, it lasted but ten days without external lesions, but with extensive formation of nodules or tubercles in spleen and lungs. The reaction of these experimental animals is usually so uniform that I

should not credit this to any weakness on the part of the guinea-pig. Moreover, the source of the material confirmed the view taken of a difference in virulence.

I do not intend to convey the impression that it has not been frequently asserted that variations in the severity of epidemics were due to differences in the specific germ. I simply call attention to some facts which demonstrate what have been hitherto rather vague and unproved assertions. They serve to illustrate variations going on, or already existing, in nature and revealed in the laboratory, not so much by form or culture as by inoculation, which brings into play the very delicate vital forces of the animal in opposition to the invasive tendency of the temporary parasite.

We have thus far taken for granted that our disease germs are derived from forms like those living in our surroundings, and that they have adapted themselves in some unknown way to various degrees of destructive parasitism. In some this habit has become so perfected that they have nearly or quite lost the capacity of living outside of their hosts. They fail to grow in artificial media, or else develop only when their natural environment has been imitated as closely as possible. Among these forms are the well known bacilli of tuberculosis, leprosy, and the still hypothetical microbes of syphilis and rabies. In a number of other disease germs the parasitic habit is but slightly developed, and the saprophytic mode of life still as marked as with many harmless germs. They are cultivated on various substrata without difficulty, and it seems as if their invasion of the living animal organism were more of an accident. If this be so, and it seems very probable, then we must conclude *that they have acquired their pathogenic properties outside of the body.* Hüppe, in a recent address on the relations between putrefaction and infectious diseases, is the first, to my knowledge, who has presented this view as a deduction from present bacteriological researches. He discusses it in a very suggestive way, and points out the important fact that this property must have been acquired under circumstances very near those obtaining in the animal body, such as are presented by the decomposition of albuminoids or putrefaction.

Let us see how far this theory accords with facts. Conditions favorable to putrefaction are offered, first of all, in the digestive tract of man and animals. Hence, we may expect to find some pathogenic bacteria in this locality. Dr. Sternberg has found a microbe in saliva, not distinguishable from the organism identified later on as the cause of one form of croupous pneumonia and cerebro-spinal meningitis in man. Gamaleia, the author already referred to for several valuable discoveries, recently discussed at length in Pasteur's journal the etiology of croupous pneumonia. With the aid of animal inoculation he was able to demonstrate the presence of the *diplococcus pneumoniæ* in every case of this disease which he examined. He concludes that this organism is the sole cause of pneumonia, and that the pneumococcus of Friedländer is a mere saprophyte in the diseased lung tissue. One of his co-workers made

careful investigations as to the presence or absence of the diplococcus in the saliva of healthy persons, and he actually found it in one half of the persons examined. Experiments on sheep showed that intratracheal injections of this saliva germ were incapable of producing pneumonia, unless the lungs had been previously diseased or injured. This would interpret the results of clinical observation in making two factors necessary for the development of the disease,—external meteorological influences and the infectious agent. This also harmonizes with our observations concerning the development of infectious pneumonia in swine, for the germ of this disease, or one not distinguishable from it, may be found in the upper air-passages of a certain percentage of healthy swine. The bacillus of malignant œdema, so markedly pathogenic when introduced beneath the skin or into the muscular tissue, may be found in the intestines of most of our domesticated animals. I have already referred to the presence of fowl cholera or rabbit septicæmia germs in the intestines of pigeons in Russia. The digestive tract must thus be regarded as one of the sources of pathogenic forms; and the future will no doubt bring to light new forms living as harmless saprophytes at one time or in one species of animals, and producing disease at another time or in another species. The decompositions and changes which they induce in the former situation must be considered as preparatory stages in the final acquisition of pathogenic properties. In fact, one microbe, the cholera spirillum, produces disease without possessing any invasive power. As Hüppe has pointed out, Asiatic cholera is simply an abnormal putrefactive process going on in competition with the bacteria ordinarily present in the small intestines.

The illustrations given under the head of variability show that these pathogenic germs living on the mucous membranes are not in the condition to produce disease until some abnormal condition of digestion, some congestion of the lungs or catarrhal condition of the air-passages, the reduction of vitality by the ptomaine poisons of putrefaction, pave the way. By these means a nidus is frequently furnished where the bacteria in question may multiply, and thus gain a preliminary advantage in numbers, and very likely in virulence. Expressed in another way, these bacteria are always potentially, but not kinetically, disease germs.

Besides the digestive tract and its contents, we may regard the putrefaction going on around us—the filth which the crowded condition of large cities so abundantly furnishes—as another, and, perhaps, the most fruitful source of disease-germs. Koch isolated at least four kinds, capable of producing septicæmia and pyæmia in animals, from decomposing blood and other matter. Mori (Zeitschrift f. Hygiene, IV) found three bacteria fatal to animals in the water of sewers. The staphylococci, causing suppuration, may be considered ubiquitous organisms. It is true that this group may only produce disease by gaining entrance through wounds and injuries, and thus are of more interest to the surgeon than to the student of hygiene. Yet they merely present another phase of the problem before us—the sources of pathogenic bacteria.

The statements which I have made to-day may, for the sake of greater clearness, be briefly summarized as follows: Observation and experiment seem to show that in our surroundings the process of putrefaction so called is shared by a number of true disease-germs, some of which require a slight impulse to produce sporadic or epidemic diseases in man and animals; that the pathogenic property of these germs has been acquired through unknown periods of time, and is now simply latent, bursting forth occasionally to again subside. This does not apply to strictly parasitic forms, but to the causes of those still mysterious lung and intestinal diseases of man and animals, as well as septicæmic, pyæmic, and puerperal diseases, which seem to hold on to an unknown saprophytic existence while acting accidentally as true disease-germs.

It may be said that if such views are true, if disease-germs are present as saprophytes in the excreta and secretions of man and animals, and in the filth that is in great part formed by these in our environment, it is a hopeless task for the sanitarian to grapple with them. This may be true with reference to such germs as we carry in our own saliva, and which are presumptively the cause of pneumonia; but with regard to the great majority, it is a purely superficial inference. The removal of filth from human habitations and its proper disposal, the prevention of soil and water pollution, have always been the self-imposed tasks of sanitarians, and the difficulties are neither increased nor diminished by regarding such filth as dangerous. In fact, it has always been looked upon as a nidus of disease, until the earlier researches of Koch and contemporaries took a somewhat different ground, by failing to recognize the possible variability of pathogenic organisms. They looked upon their presence in putrefactive processes as accidental. Now we are slowly returning to the older position, and filth will resume its former importance in the eyes of public health. It is true that putrefaction may and does destroy the more highly parasitic bacteria, but there is a no less destructive competition between the outspoken putrefactive bacteria themselves. Hence, even if they do destroy cholera spirilla in a few days, it does not militate against the assumption that the latter likewise carry on a kind of putrefaction, a fact of which any one may convince himself by smelling a culture of these germs.

In conclusion, I must say that I have presented what may appear to be mere theories supported by a few positive, interesting facts. Theorizing as to what bacteria in general do from what one or two are known to do has always proved a rather dangerous pastime, not because it is more apt to go wrong than in other lines of research, but because of the importance of the consequences involved. But I believe that while we must hold fast to every old fact and every new one which come to light, we must likewise entertain theories as to what we do not yet know—theories that invariably go with already known facts, and not against them. It is a fault of most of our theories that they do not frankly square up with the present, and in so far they are harmful. I have endeavored to do a little of this squaring up, and in so doing have indi-

rectly pointed out the great importance of cleanliness as a preventive of disease.

I would also point out that almost all new ideas have been derived from observation of and experimentation upon animal diseases. The study of animal epizootics and of microbes pathogenic in animal life is, to my mind, of inestimable value in casting a strong light upon corresponding diseases of man, their causes, genesis, and mode of prevention. In the latter, observation is limited, and certain lines of demonstration, such as inoculation, are entirely suppressed. Analogy must then be invoked to produce conviction in sceptics; and this is best accomplished when the student of public health makes himself thoroughly familiar with the results of well rounded, trustworthy investigations of infectious diseases among animals. Here, as in physiology and pathology, animal diseases must form the chief, in some directions the sole, stepping-stone to human diseases and to the solution of those problems which they are forcing upon us in increasing numbers. At the same time it becomes the duty of those intrusted with such investigations to make public their results in such a way as to bring them within reach of the medical profession in general and of sanitarians in particular, to point out any analogies existing between human and animal diseases, and to make such suggestions and draw such inferences as may throw light upon the obscurity that still prevails with reference to most human maladies.

XX.

METEOROLOGICAL OBSERVATIONS AS RESPECTS DISEASE PREVALENCE.

By Prof. W. W. PAYNE,

Director of the Observatory, Northfield, Minn.

I desire to call your attention in this paper to a plan of coöperation between the general Signal Service work of the United States and that of the various sanitary organizations that may seem to you desirable because possibly beneficial to both.

The difference of opinion concerning the relation of weather conditions and ordinary physical well-being of people is very great. One man believes that such relations do exist; others claim to know that there are important relations between the atmospheric changes and the sensitive condition of persons needing the care or skill of the physician; still others think that varying weather conditions have to do with the prevalence, at least, of certain kinds of disease, and probably furnish the means of their propagation.

But there are other good people who do not believe that the weather has anything whatever to do with the ills of humanity, either as a cause for them or as a means of multiplying them; and some go so far as to claim that if atmospheric conditions do at all affect the health record, it will be impossible, in the nature of the case, to prove such a fact.

These are some of the views that people hold concerning the relation of the weather and general health. Now, the existence of such a relation (if there is any) is simply and plainly a question of fact, and it ought to be studied like any other question of fact. The court of science has jurisdiction, and there is a way to try the case as an issue of fact. But what is first necessary before such a trial may proceed is, to gather and arrange existing evidence. Opinions are good as opinions merely. If A, B, or C gives his opinion of a fact formed in some unaccountable way, that is not evidence for or against the fact that thinking men should be called to believe. Neither do we want to admit the dictum of anybody's personal bias as legitimate evidence in settling such questions of fact, unless such dicta are all that the circumstances of the case furnish. But what we do want is competent evidence that shall be open to public scrutiny and just public criticism. From such evidence a judgment can be reached and a reasonable decision rendered that shall command the respect of intelligent people.

The question of first importance in this discussion, as we see it, is not whether there are any important relations between the weather and

public health, nor, if such exist, is it what they are, but, rather, Have we, as scientific men, gathered the evidence within our reach that would properly raise the first question, and possibly go far in settling what those relations are?

As said in the beginning, it is the purpose of this paper to present a plan of coöperation between the Signal Service observers of this country and the various organizations, in the interest of public health, whereby reliable evidence from both sources may be obtained for the proper study of many perplexing questions with which the sanitary man has to do, and in which the public generally are deeply interested.

I need scarcely say that the Signal Service of the United States is so thoroughly organized that all data which it furnishes from direct observations by its officers are of a very high order. In addition to the government service, some twelve or fifteen states have taken the step of organizing what is called a State Weather Service. Most generally this is done by legislative enactment, for the purpose of aiding the government service on the one hand, and also to extend the benefits of the government service as widely as possible to all the localities within the limits of individual states.

The government service coöperates with these state services in furnishing to them at all their stations the daily weather predictions from Washington by telegraph, gives instructions concerning all meteorological instruments to be used by the state service observers, and practically directs how and when all meteorological observations shall be made, reduced, and tabulated. The officers of state services obtain these approved meteorological instruments through the chief signal office at Washington, at a cost to local stations which the government itself pays, and no more. These instruments are tested in Washington before they are sent out, and proper correction-papers showing the instrumental errors accompany them. In addition to this a government signal officer is now furnished to each state service, who is put in charge of its central station and charged with the responsibility of the details of the state services, that all their data may be made to harmonize with that of the general service.

All local observation in these state services is voluntary, inasmuch as the observers are not paid for their services. It is not usually a difficult matter to interest the corporation even of a small village to purchase a full or partial set of meteorological instruments. Neither is it a hard task to find some responsible and competent person to act as voluntary observer, if a set of fine meteorological instruments is furnished him. By actual experience we have found this to be so in more than half the counties of Minnesota.

But the greatest hindrance which we have had to meet during the last eight years, in this matter of voluntary observation, was the frequent change of observers. At first this was quite discouraging, and was greater than was anticipated. But three years ago, when the system of flag signals was devised, and daily weather indications were generally distributed to local observers, this service was manifestly so useful to the

public that thereafter it was not so difficult to secure better local voluntary observation of temperature, barometer, precipitation, and the verification of the weather predictions, &c., &c.

Still, at this point, really the weakest one in the system of voluntary observation, the officers of local boards of health could render very valuable service in aiding to secure these necessary meteorological data. What the state services want most are reliable readers of instruments. The necessary reductions of observations for the sake of comparison can, and ought to be, done at the central stations, under the direction of an experienced signal officer. To read the instruments and make all the records ought not to consume more than thirty minutes for all the readings which are required daily.

Now, as to the details of a plan of coöperation which I have suggested, I would ask your attention to one which we are trying to develop in Minnesota, the working points of which were devised by my good friend Dr. Hewitt. For convenience in his own work as secretary of the state board of health, he has divided Minnesota into districts, as indicated by the prominent boundary colors on the map.

Prominent water-courses were the division lines generally, giving small compact districts, with territory usually quite homogeneous. This division of territory is not regarded as final, for in working the signal service of the state, or carrying out the plans of the state board of health, or the union of the two, it may be found best to change this plan of division, especially if the study of magnetic force is included in the plan of observation.

The heavy colored dots indicate the position of Signal Service stations belonging to the state and government services. These stations have been reporting monthly to the central office in St. Paul, in the Chamber of Commerce building of that city, and in rooms adjoining the government signal office, located there also.

It is our purpose soon to make a change in the plan of reporting the readings of local observers, so as to secure weekly reports instead of monthly ones. In this way the central office will be able to keep up closely with all reductions and table work, and give time for the preparation of graphic curves of some facts, and the prompt publication of all meteorological data soon after the close of the month to which they belong.

Now, if all these accurate and systematic meteorological observations can be graphically represented by curves based on coördinates that may be used by the health officer in arranging his curves for disease prevalence, a means of determining coincidences is at once in hand, and if there be a relation between the data of these two different lines of work, it must certainly appear in the course of time.

Not only this, but if any such relations are found to exist, it is fair to presume that something of the nature of those relations will also appear from a continued study of the same evidence.

The points, then, which this Association is asked to consider, and, if found worthy of indorsement, to approve of, are the following:

1. Accurate and systematic meteorological data are a source of useful evidence in sanitary work and study.

2. That Signal Service organizations, and those in the interest of public health, ought to coöperate in securing needed meteorological data for the best results to all concerned.

3. A prompt publication of results is very desirable.

XXI.

"NEW ORLEANS, TO BE SAVED, MUST BE DRAINED AND CLEANED."

PORTLAND, OREGON, November 9, 1888.

H. DUDLEY COLEMAN, Esq.,

President of the Chamber of Commerce of New Orleans:

DEAR SIR: Your kind letter, enclosing a certificate of my election as an honorary member of the New Orleans Chamber of Commerce, was received with a sense of gratification and reasonable pride.

Having filled the measure of my ability to relieve the urgent necessities of my fellow-citizens of New Orleans, through methods of protection against pestilential invasion coincident with the preservation of commerce, upon which they almost wholly depend, and having exhausted every effort to bring about a reformation in the drainage and cleanliness of the city, upon which all hope of improved health, the general comfort, the well-being and assured prosperity of the people is necessarily established, it is, indeed, some reward to receive such a recognition as that embodied in the resolution conferring upon me honorary membership in your commercial organization.

In acknowledging this mark of your personal esteem, I would prefer to reveal my never changing loyalty to my native city and tender affection for its people by giving utterance to appropriate sentiments expressive of the same; but my solicitude in their behalf is always foremost, demanding the unwelcome but salutary truth first, and complimentary assurances later.

While appreciating the honorable distinction, your action has aroused emotions I have earnestly endeavored to repress—feelings of bitter disappointment, of sorrow and regret, that I have been compelled to wipe out the professional work of a lifetime, to sever all ties of old and dear association, and transplant myself to begin anew in a far distant region, forced into that extreme resort as the only escape from the anguish and despair continually oppressing me when surrounded on every hand by the silent but woeful witnesses of the official negligence, the inhuman disregard and rapacity, to which our people have been subjected through decades of years prior to the present well intentioned but poorly provided city administration.

Having devoted the best energies of my life and years of labor to the fulfilment of a true citizenship, and having sacrificed every personal consideration to that end, it is not incumbent upon me now to remain silent, nor to cloak my convictions with conventional phrases of etiquette. I

have earned the liberty to speak in behalf of that cause and of that people I have most esteemed; and although wearied and heart-sick by reason of "hope deferred," my opinion, still unchanged, is, that "NEW ORLEANS, TO BE SAVED, MUST BE DRAINED AND CLEANED."

Personal, domestic, and municipal cleanliness constitutes a very large department of my practical religion; and for the sake of my religion intact have I abandoned home, personal interests, and friends, content to make new friends and a new home in this farthest corner of the country, rather than subject myself and family to the mischievous influences of a cesspool in a swamp, to clean up and drain which I had exhausted energy and hope.

The little handful of far-sighted, public-spirited citizens, led by the admirable Edward Fenner, Joseph Shakspeare, and the board of health, supported by an enlightened and progressive daily press, have likewise exhausted energy, and have labored in vain to overcome the prodigious inertia, the apathy of a destructive so called conservatism, really a fatal indifference, the absolute dead weight of a vast majority, contented with their surroundings, accustomed to that which should not be tolerated, oblivious to the fearful teachings of their own history, and unmindful of consequences.

A sanitary condition implies a state of obedience to the principles of physical and moral health. The neglect of these is always associated with retrogression and decay.

While this is, no doubt, offensive to hear, it is none the less true: no creature can part from sanitary law without a correlative and proportionate degradation.

Inasmuch as no quality of citizenship demands of a man the loss of self-esteem, or any degree of degradation of himself and family, when the conditions of his life in a community are of this kind and obstinately resistful of remedial efforts on his part, manhood and religion then demand the severance of civic ties and the assertion of self.

New Orleans, to-day living under conditions subversive of normal growth and prosperity, manifests no serious intention to remedy evils the disastrous effects of which have long been felt and ultimate consequences predicted. To this date every period of her history has confirmed the conviction expressed in my address before the Medical and Surgical Association, October 31, 1885: "There is no beginning to the solid advancement of New Orleans, except the beginning of assured health established upon the efficient drainage and sewerage of the city! . . . What would be the difference between property values in New Orleans, undrained, sometimes partially inundated, no efficient sewage disposal, and a high death-rate, and New Orleans thoroughly drained, its sewage disposed of promptly, and mortuary statistics permanently reduced?

"With so many conditions favorable to the possibilities and comforts of living, presenting an unlimited field for manufacturing and commercial enterprise, why are there not a million of inhabitants? Simply

because our record is open before the world. Just turn to your Worcester's dictionary, unabridged, for the word sanitary, and you will find an instance of its definition cited thus: '*The sanitary condition of New Orleans as illustrated by its mortuary statistics.*' We all know the import of that explanation.

"The world demands of us a reasonable guaranty for the protection of life and health"—I should have added *property;* for an undrained soil and unsanitary condition are destructive of building material and property values. "No prudent man can declare his confidence in the safety of New Orleans from invasions of pestilence until these conditions which invite, yea, seem indeed sufficient to create, disease are radically destroyed.

"*Quarantine as we may, declare non-intercourse with the world, build around ourselves a wall without gates if we will, until this city is provided with a superficial and sub-soil drainage, and its sewage disposed of through some efficient system, we live in jeopardy, yea, in the certainty of disaster.*

"NEW ORLEANS, TO BE SAVED, MUST BE DRAINED AND CLEANED."

If, therefore, by a course of inaction, and under the plea of poverty or any other apology offered inexorable nature as an excuse for the violation of law, New Orleans elects to remain undrained and unclean, in the impending fate the citizen must determine for himself his first allegiance: and mine is always to my family, in such a case.

I have not replied to you earlier because I have felt in duty bound to write what is herein contained; but to do so has been painful, and an instinctive shrinking has caused me to postpone it from day to day.

Please express to my friends of the Chamber of Commerce my sincere appreciation of the favor they have bestowed upon me, and assure them, as an honorary member, I feel obliged to do all within my power to favor the prosperity of New Orleans, particularly her commerce, and for that reason have written this letter of acknowledgment as worthy of amiable acceptance and consideration.

With sentiments of high esteem, I remain,

Your friend,

JOSEPH HOLT, M. D.

XXII.

THE FLUSHING TUNNEL AT MILWAUKEE.[1]

By GEORGE H. BENZENBERG, City Engineer,
Milwaukee, Wis.

Mr. President and Gentlemen: I am hardly prepared to give you anything that might be of interest; but upon repeated requests from our commissioner of health, I determined to state to you just a few facts and figures with reference to the so called flushing tunnel and its operations. I do not know that it is a matter of particular interest to you, but it has been one of vital interest to our citizens here, and of course they imagine that everybody else has an interest in the matter.

The city is divided by three rivers. Milwaukee river, from the mouth of the harbor northward, divides the city into the East side and the West side, and is the main outlet for nearly all of the sewers in the city, amounting in number to about forty-five,—some twenty-two from the East and about the same number from the West side, draining a territory of perhaps 4,500 to 5,000 acres, with a population of about 125,000. The sewage discharged into the river through those sewers amounts daily now to about twelve to fifteen million gallons. This discharge of sewage into the river has been going on for perhaps twenty-five years, increasing every year as the sewerage system was enlarged to wards in the outskirts of the city. The river has no current whatever, excepting during a rain-fall or the spring freshets. It is subject to the rise and fall of the water in the lake, varying with the course of the wind, an east, north-east, or south-east wind piling up the water in the bay, and consequently in the river, to the extent of all the way from three to eighteen inches. The result is a flow or current up the river. As the water in the lake again falls with the cessation of the wind, or with a west wind, the current goes out. The result is this, that the solids of the sewage discharged into the river remain and settle to the bottom of the river, so that there has been a deposit of sewage sludge formed to the amount of a foot to two feet and half in depth—more of it down to the lower end, near the harbor, less at the upper end. This sludge, when the water had reached a certain temperature, began to generate gases noticeable to every one crossing the bridges by the bubbles of gas reaching the surface of the river. This would continue uninterruptedly if there were no rain during, or immediately before or after, a warm spell of weather, and after three to five days the water in the river would become colored,

[1]An extempore address upon being asked for some facts regarding the tunnel.—*Secretary.*

gradually assuming a dark color; in other words, the water would absorb all the gases in their passage from the bottom of the river to the surface until it became saturated; and there being no current, it remained stagnant in the bed of the river. When the water had absorbed all the gases it could, the gases came to the surface, filling the air with a strong and very offensive odor, quite noticeable to any one crossing the bridges, or who was anywhere within half a mile of either side of the river. At such times, of course, the public would complain very bitterly as to the condition of the river, and rightfully so, too.

The permanent and radical way of remedying this nuisance, no doubt, is by a system of intercepting sewers.

Another of the streams is the Menominee river, from the west, running due east, and joining Milwaukee river within half a mile from the mouth of the harbor. The Menominee valley is largely a manufacturing valley, occupied by manufacturers, railroad lines, and slaughter-houses, distilleries, breweries, &c. The river, though not receiving the discharge from as many sewers as perhaps the Milwaukee river, is much more offensive than Milwaukee river on account of the discharge from slaughtering houses, distilleries, and other manufacturing establishments. An intercepting sewer had been under construction for some years, and is now complete to pretty nearly the western limits of Menominee valley, taking the refuse from all the slaughter-houses, with the exception of one, and from all other establishments, with the exception of the stock-yards, one distillery, and the sewers emptying from the north, which drain a territory of perhaps two thousand acres, and which still discharge into the Menominee river and canals.

Upon making an estimate as to other intercepting sewerage systems sufficient to collect the entire dry weather flow of the city, I found that the expense would be so great that it would be impossible for this city to meet it for the next ten or fifteen years. We have a fixed limit to our bonded indebtedness that the city had nearly reached at the time this matter was agitated; and the city could not consider an expense of two millions and a half at least in intercepting sewers so long as that limit of bonded indebtedness hung over its operations. Even if we had the money, it would have taken five to six years to construct the sewers, for the discharge would have to be a long distance south from the bay, no other system of final disposal of the sewage being practicable here, the soil not being such as would permit the construction of irrigation or sewage farms, nor the disposal of the sewage by filtration. The chemical process might be entertained here, and the manner of disposing of the solids by precipitation; but you all know that is an expensive manner of treating sewage, especially when the consumption of water amounts to about one hundred and twenty-five gallons per day for every man, woman, and child in the city. We are very liberal in our supply of water.

Of course the next question was, how to dispose of our river nuisances. I made a number of experiments and tests with the sludge

taken from the bottom of the river, and found that when the sludge had settled in water, at a temperature of perhaps 60° to 65°, and held there, that the sludge would remain dormant, inactive, producing no gases; but as soon as the temperature was raised to 70° or 75° degrees, the generation of gases would at once begin. On a smaller scale, at home, I found the same action taking place that I have described to you with reference to the sludge in the river. I kept the sludge in a tub a week or ten days without any action whatever taking place so long as the temperature of the water was kept down to 60° or below; but when rising above that, gases were generated, and in a few minutes, say half an hour, the water had turned almost jet black, and the gases became offensive, so much so that I had to get the stuff out of the house as quickly as possible.

We also found that after a very heavy rain shower the river was not offensive for perhaps two or three days. The stagnant water in the river was displaced by surface water gathered from the water-shed of the Milwaukee river, and would remain all right and satisfactory to our people, although it had a very dark color, being, as I said, surface water largely; still, our people were satisfied in that it was not offensive to the nostrils. I then devised the plan of building a tunnel to the lake, across the narrow neck of the upper end of the east side, where the river runs north-easterly a distance of 2,500 feet to a point immediately below a dam constructed across the Milwaukee river, with the view of discharging into the river a volume of water about equal to that in the river from the dam down to the outlet, being about 350,000,000 gallons or thereabouts. The cost of the tunnel and works was such that we could meet it, it being estimated at about $225,000, and the entire cost has exceeded that amount only about $3,000 to $4,000. There was this further advantage, that the tunnel could be constructed within a very short time; in fact, the time from the day when the first pick was struck into the ground until we began pumping did not exceed much beyond nine months. The tunnel is 12 feet in diameter, built on a level from the lake to the river, about 2,500 feet in length, and at the crown or arch 2½ feet below low water mark in the lake, or 3 to 3½ feet below average height of water in the lake. It was decided that a pump of a capacity capable of forcing that volume of water from the lake to the river, under a head of about three feet, would have to be constructed, and determined that a screw wheel or propeller wheel would perhaps be the best design for it. A contract was entered into with E. P. Allis & Co., of this city, to furnish such pump and boilers, the same to develop a duty of not less than 70,000,000, which requirements have never been excelled, nor even reached within ten or fifteen millions anywhere in the country on a similar style pump. The pump was put in, and we are now discharging water from the lake into the river at about the rate of 400,000,000 gallons per day, the result being quite noticeable within fifteen hours after the wheel was turned. The color of the river water was quite black at first, but within fifteen hours thereafter the color had

turned to a light drab, and within three or four days after, the water became quite clear; and to-day, along the main current of the river, perhaps five or six feet below the surface, the water is nearly as clear as that in the lake. The surface, which receives the dust and the floating *débris* perhaps is the worst feature of our river to-day. The intercepting sewer on the south side, running along on the south side of the Menominee river, is constructed of a capacity to answer the purpose of an intercepting sewer for the next fifty years. Of course the sewer has a large surplus capacity at present, which is being utilized by having connections made with it from the westerly end of a system of canals running along the Menominee river. Not only are the sewers in that valley discharged into this intercepting sewer, but also the filthy waters which are in the canals, by pumping out the water from their westerly ends, and supplying them with water from the Milwaukee river from its junction with the Menominee. In that way we have been able to clarify the river, and get the water in such a state that it is almost pure to the bottom in and along the south parts of the Menominee valley.

The current on this side of the lake is generally toward the south, in fact, is uniformly toward the south, with the exception when it is counteracted by a heavy wind from the south-east or south-west, at which times the surface water is carried off toward the north, or perhaps to the east, out into the lake, as a resultant current. Heretofore the discharge from the rivers has been quite dark; now, however, the discharge from the river is not noticeable at the mouth of the harbor. Heretofore there has been a sharp marked line between the colored current of the river and the clear lake water, one being a light blue, the other a dirty dark color or black. The sludge along the bottom of the river has also been moved. Where we have heretofore at places had a foot and a half of sludge, there is not any on deposit now. The entire amount has been carried from that point, as to how far I am unable to say. Just as quick as I can get through the rush of work on my hands now I intend to determine how far that sludge has been moved, and where it has gone to, giving us further information, and perhaps information necessary to determine other matters in connection with our rivers and harbor.

We are at present looking to the location of our intake at a new point. We intend to take our water from a depth of about fifty to fifty-two feet below the surface of the water, so we can get absolutely pure water, and get it from a locality where it will not be likely to be affected by any surface currents.

In order to give you an idea of what has been done in the way of flushing, I have here two samples of water. This sample shows the color of our river water before we started pumping, and that is the color of the water three days after.

Of course we cannot say just how far this thing will operate. We know it has cleared our rivers, and that at a minimum expense, and that we can also increase the flow to 500,000,000 gallons per day.

If the Association intend viewing the premises, I would advise you to

go to the inlet part of the tunnel toward the pumps. There you can get an idea as to the flow of the water. There is a flow there of nearly a foot and nine inches a second in a channel of sixty-five feet across, and nine feet in depth, equal to a very fair sized river.

I thank you for your attention, and shall feel pleased if I have given you anything containing information.

XXIII.

ON PULLMAN, ILLINOIS.

By Mr. DUANE DOTY.[1]

Mr. President, Ladies, and Gentlemen: In the evolution of modern civilization, which seems to comprise the subjugation of the material world to man's uses, we note remarkable changes. Within a century, what might be termed the militant age has given place to an industrial age. The characteristic feature of our time is mechanical industry. The change of society has been from that of the rural and pastoral order to that of the urban. Man's capacity to consume the fruits of the earth does not increase in proportion to the improvements in the mechanical appliances by means of which he cultivates the soil. The farmer of to-day, by the aid of machinery, can produce four times as much with the same physical exertion as his father could produce fifty years ago; and this new condition of things necessarily liberates a large number of persons to engage in other avocations, such as the distribution of products, and in manufacturing. The controlling spirits of to-day may fitly be termed field marshals of industry. They do work upon an immense scale, requiring large numbers of operatives, which means the massing of people together in towns and cities. The rapidity with which this social and industrial change has progressed is indicated in the census reports, which tell us that one hundred years ago only three per cent. of the population of our country lived in cities and towns having a population of eight thousand and over, while to-day twenty-five per cent., or fifteen millions out of our sixty millions of people, reside in such cities and towns. There are now seven hundred and fifty towns in the United States having a population of four thousand and over, showing that one third of our population is already urban. Really, one half of it is urban and suburban.

The railroads of our country have increased 1,700 per cent. in the last thirty-eight years, aiding largely in creating this urban population, and rendering it very convenient to reside in the vicinity of a city. Hence the marvellous growth of cities, both in Europe and America, adapting populations to the changed order of life produced by mechanical industries.

This new mode of life emphasizes the necessity for the careful consideration of sanitary questions and their discussion by conventions of learned and scientific bodies like this.

[1]An extempore address.—Secretary.

The earlier village seemed to be a collection of odds and ends, devoid of everything architectural or scientific,—a mass of tenements and shops, where inconvenient arrangements and disorderly relations might have been improved by an earthquake. That hap-hazard mode of city and village building has passed away. An important step in the direction of improvement in city construction was taken thirty years ago in the building of the manufacturing town of Saltaire in England. This, while an improvement in the homes of operatives, is hardly to be compared with the new departure in city construction made by our countryman, Mr. George M. Pullman. Mr. Pullman, as you are aware, is the president of a great corporation now operating 1,600 parlor and sleeping cars upon 110,000 miles of railway, and controlling properties valued at forty millions of dollars. The cars to be made and the rolling stock to be repaired rendered a larger manufactory for cars a necessity. In the consideration or these business needs, Mr. Pullman thought of much that was far in advance of merely getting a few thousand operatives together. Believing that decent and orderly living, and that comfort, and healthful and agreeable surroundings, in homes as well as in shops, would conduce to the prosperity of both labor and capital, he planned and has commenced building a city which marks an era in the history of labor.

The beginnings of this great enterprise already furnish homes for eleven thousand people—homes built upon broad paved and shaded streets, and in such a manner and with such conveniences as the world has not heretofore seen in the dwellings for an entire community.

Pullman is the only city in the world built scientifically and artistically in every part, and from a central idea within one man. It needed no ordinary courage to undertake an experiment requiring the investment of millions, and to face the adverse opinions of men, opinions often verging upon ridicule, and which, at times, characterized the scheme as unbusiness-like and visionary. But the builder took the risks, and provided workmen with better homes than by their own unaided efforts they could have hoped for; and the results have justified him, for the experiment has proved a success. Mr. Pullman has made the workman more largely than ever before a sharer in the results of good work. Eight years ago he laid the foundations of his new city. He had quietly purchased about four hundred acres of land ten miles south of the southern boundary of Chicago, in the township of Hyde Park, which is an incorporated village, and now the largest and richest one in the world. Purchasing materials in very large quantities, he could build economically. All the work was done from approved plans, and under the direction of scientific men and artists. Miles of blocks of residences were put up, and supplied with gas, water, drainage, and sewerage complete. A distinguishing feature of the dwellings at Pullman is, that the drainage and sewerage all *preceded* the population, and the soil upon which the city stands is as free to-day from organic contamination as when it was an open prairie. Nearly a million dollars has already been expended in

drains, sewers, and piping of all sorts. The natural surface of the site is from eight to fifteen feet above the level of Lake Michigan, and it lies upon the west shore of Lake Calumet, a body of water three and a half miles long by a mile and a half in width. It was deemed unwise to permit sewage to flow into this small lake, and it was decided to pump it to a sewage farm which should be arranged for that purpose.

SURFACE DRAINAGE.

The storm or atmospheric water goes from roofs and streets through one system of pipes and sewers directly into Lake Calumet. This water, of course, contains no sewage. Brick mains from three to six feet in diameter are built in alternate streets running east and west, the immediate streets being summits from which the surface waters flow into the main drains or sewers. The fall is sufficient to secure good cellars or basements for all the dwellings in the city, the drain-pipes leading from cellars to the laterals being at least eighteen inches below the cellar bottoms. A two-feet cobble-stone gutter borders either side of every street, leading at short intervals of about one hundred and sixty feet into catch-basins, these basins connecting either with laterals or main drains. This system of surface drainage is calculated to carry easily an amount of water that would cover to the depth of one inch the entire area drained. The heaviest rain-fall ever known in this latitude (six inches in twenty-four hours) was carried off without difficulty by these drains. For the drainage from lots six-inch pipe is used, while for block drainage and for the laterals pipe varying from nine to fifteen inches in diameter is used. The parks and play-grounds are thoroughly drained. The amount of vitrified pipe already laid in the town is as follows: 18-inch pipe, 4,500 feet; 15-inch pipe, 7,000 feet; 12-inch pipe, 7,000 feet; 9-inch pipe, 16,000 feet.

There are also several miles of six-inch pipe. In addition to this piping from six to eighteen inches in diameter, the necessary quantity (about ten miles) of four-inch tile has been used to carry water from cellars and down spouts to laterals, and for draining the parks and play-grounds.

The lands surrounding the town are well drained by ditches.

DEEP SEWERS FOR SEWAGE.

In every other street running east and west, and lying between the streets having brick mains for surface drainage, there are sewers made with vitrified pipe which lead into mains running north and south to a large reservoir under the water tower. These mains enter the reservoir sixteen feet below the surface of the ground. These glazed pipe sewers are from six to eighteen inches in diameter, and constitute another and separate system of drains which carries the sewage proper, by gravity, to the reservoir. The smallness of this pipe ensures a scouring which keeps it very clean. The reservoir holds 300,000 gallons, and the sewage is pumped from it as fast as received, and before sufficient time

elapses for fermentation to take place. The ventilation of the reservoir is perfect. Eight flues run from it to the top of the tower above it, and a twenty-inch flue leads from it to the large chimney which takes the smoke from the fires under the boilers of the Corliss engine. The sewage is pumped through a twenty-inch iron main to a sewage farm about three miles distant; and at the farm end of this main the sewage goes into a receiving tank which contains a screen placed in a vertical position through which substances that are more than half an inch in diameter cannot pass. The pressure of the sewage upon the tile piping in the farm is not allowed to exceed ten pounds to the square inch. The sewage from dwellings now amounts to one hundred gallons a day for each person of the population. This seems a large amount; but when it is remembered that every tenement is provided with the best of closets and sinks, and ten per cent. of them with bath-tubs, and that the water-taps are all inside the houses, it will be seen that a large amount of sewage per capita is unavoidable. The laterals of the deep sewers run in the alleys. All these sewers are provided with manholes at intervals of one hundred and fifty feet, and also with means for flushing them.

THE SEWAGE FARM.

About one hundred and forty acres of land have been thoroughly underdrained and piped for the reception and purification of sewage, with which these acres are irrigated by means of hose. Hydrants are placed at convenient intervals, so that the distribution can be easily effected. There is nothing offensive about this work, nor can one detect noxious odors at the pumping station, nor often at the farm. All organic matter in the sewage is at once taken up by the soil and the growing vegetation, and the water, making from one hundred to five hundred parts, and sometimes even more, of the sewage, runs off through underdrains to ditches which carry these filtered waters into Lake Calumet. Where the sewage water, purified by filtering through the soil, leaves the drains, it is as clear as spring water. One acre of land takes care of the sewage made by one hundred persons.

The primary object of a sewage farm is to dispose of sewage; and the question in Europe is, not what such farms can be made to pay, but at how little loss may sewage farms be run. By so much as you get returns from your farm, by that amount do you diminish the cost of the disposal of your sewage. Sewage must be disposed of in some way at any cost. The proper sewage of towns is becoming one of the gravest questions, as it affects nearly one half of the population of the country. It must be taken up and considered by states, as has been done in Massachusetts. The productive value to society of those who die from preventable causes, and the value to agriculture and horticulture of sewage and other waste, cannot be put at less than one million of dollars a day for this country. Add to this loss a larger one, which results from the diminished capacity consequent upon unsanitary environments, and we begin to realize the vital importance of sanitary measures. There ought

to be intelligence enough in the land of schools and journals to fully appreciate the bearings of the appalling fact that about as many people in this country die annually from preventable causes as perished during the whole period of our recent civil war, or losses of life fairly attributable to the war.

OPERATIVES.

The average number of operatives in all the industries at Pullman for the year ending July 31, 1888, was five thousand, and their earnings were ten thousand dollars a day. Favorable conditions, pleasant surroundings, the absence of deleterious influences, and steady employment, are highly conducive to the contentment and general prosperity of the people of Pullman.

The average annual earnings of all operatives in Pullman, inclusive of men, women, and children employed, have been as follows:

For the year ending July 31,	1885, ...	$576 each.
" "	1886, ...	586 "
" "	1887, ...	601 "
" "	1888, ...	604 "

In no other place where similar work is carried on are the average annual earnings of operatives so large as at Pullman. There are no idlers in the place; all are busy earning money, and are self-reliant and self-supporting.

SANITARY FEATURES OF THE CAR SHOPS.

The lowest ceilings in any shop are 16 feet high. The ceiling of the cabinet shop, where five hundred men work, is 25 feet high. The ceiling of the freight car shop is 35 feet high, and that of the hammer shop, where axles and other heavy forgings are made, is 70 feet high, and ample lattice-work at the top and sides secures perfect ventilation. All shops where wood-working machinery is used are ventilated by means of exhaust fans and galvanized iron piping connected with all the machines, which not only change the air of all the rooms once an hour, but carry off all dust and shavings to the furnaces to be burned. A suitable force of men and boys keep the shops scrupulously clean.

Well warmed, lighted, ventilated, and tidily kept, the car shops at Pullman, which now embrace twenty-five acres of floor space, cannot be surpassed in advantages and comforts. The shops first built are supplied with gas; the later ones have electric lights. The roofs of shops are partly of glass, in addition to the unusual amount of window space lighting large rooms from all sides.

HEATING.

All the shops are heated by steam, and are kept at a uniform temperature. The health and comfort of workmen have been carefully considered.

SAVINGS DEPOSITS.

Twelve hundred operatives have savings deposits in the Pullman Loan & Savings Bank at Pullman. Their general prosperity is indicated by the fact that since the opening of the bank the number of deposits has steadily increased, and the average amount to the credit of each depositor has steadily increased. The total of these savings deposits is now $300,000.

WOMEN AND GIRLS.

Only about one hundred women and girls are now employed in the shops, but arrangements are making to bring industries to the place which will employ large numbers of women. Carpet-making, knitting, and weaving it is expected will soon be added to our industries, furnishing opportunities for women to engage in pleasant and profitable employment.

Pullman, as it stands to-day, is but the beginning of this great enterprise. It would be unfair to select features incident to the newness of an enterprise, and discuss them as characteristics of a finished product. The possibility of such a city all depended upon having everything at the outset under the control of one man, and to remain under that control until all such features as streets, parks, drainage, sewerage, gas, and water were so well established that no body of men in the form of a common council would dare to change them, but would simply extend them upon the plans already fixed. Hence, we readily see the necessity for delay in selling property and having a divided ownership at too early a date. Mr. Pullman is now about ready to place houses and lots in the market; and it has always been a part of his plan to do so at the proper time, and when, in the process of selection, a body of operatives had been secured who would make excellent citizens. Certain critics have claimed that Mr. Pullman's plans of not letting operatives buy homes was wrong; but as Mr. Pullman never had any such plan, the criticism is only an expression of the critics' ignorance of the situation. An occasional critic a thousand miles from us rings a few changes upon the notion that Mr. Pullman's methods are those of the Czar of Russia, etc. The fact that no one goes to Pullman or remains there, except of his own free will, and because he can do better there than elsewhere, shows the absurdity of that idea. There is not a large manufacturing establishment on the continent where operatives are allowed so much freedom as at Pullman. The restrictive and oppressive rules and regulations of which you may have heard have never been written.

THE DEATH-RATE.

Since the first family came to Pullman, January 1, 1881, to October 1, 1888, the annual death-rate had averaged less than nine for each one thousand of population. From the best data accessible, I have gathered that the average annual death-rate of the world is now thirty-two for

every one thousand of its population. The death-rate in American cities is about twenty-two and a half per one thousand. In old cities, like Munich, Berlin, Paris, and Vienna, the rate is near the world's average, while in such a city as undrained Mexico, the rate is from fifty-six to sixty per one thousand. There can be no doubt that the low death-rate at Pullman is fairly attributable, in a great degree, to its excellent sanitary condition. Zymotic diseases are rare, and never epidemic there. (Applause.)

All history teaches that the masses of men are steadily rising to higher levels; and the strong ones of the race who aid in this growth to better by labor than has hitherto been done is a matter of highest moment to all men, and this city and its lessons mark an epoch in the industrial life of races. This experiment is studied by intelligent men of all countries, and it has become an important factor for its suggestive value in city building and city extensions everywhere. To the man of science, to the student of political economy or social science, and to capital, the city of Pullman presents the most absorbingly interesting social study of modern times. In the not distant future a great university will be founded there, which, with its schools and libraries, will be in keeping with what has been begun and is to be.

I have tried briefly to sketch such features of the new city as have a bearing upon public health, and have already consumed the time allotted to me. I thank you for your attention.

PROCEEDINGS AND DISCUSSIONS OF THE SIXTEENTH ANNUAL MEETING,

HELD AT

MILWAUKEE, WIS., NOVEMBER 20–23, 1888.

TUESDAY, November 20, 1888.

MORNING SESSION—10 *O'CLOCK.*

Meeting called to order by the President.

Prayer by Rev. Theodore Clifton.

THE PRESIDENT.—Announcement from the Committee of Arrangements, by Dr. Martin, Commissioner of Health of Milwaukee.

DR. MARTIN.—I have no announcement to make, except that the ladies have provided for our members in the habit of indulging in the weed, a comfortable little room for that purpose. This hall is owned by the "Woman's Club" of Milwaukee. Further on in the meeting we hope to announce that the cab companies have given us tickets, whereby we can ride on the cabs without getting swindled, as we commonly are in other places, and the telegraph companies will also give us reduced rates.

The PRESIDENT.—Announcements from the Executive Committee.

The SECRETARY.—I have here twenty-five applications for membership, which have been passed upon and recommended by the Executive Committee. I suggest to the Association that the Secretary be instructed to cast the vote of the Association for admission to membership of the persons named in the applications.

A motion that the Secretary be so instructed, was made, seconded, and carried.

The SECRETARY.—I deposit these names, as the ballot of the Association, in favor of their election.

The PRESIDENT.—Report of the Treasurer.

The Treasurer, Dr. J. Berrien Lindsley, then read his report.

A Committee of Three was appointed by the Chair as an auditing committee on the Treasurer's report.

Dr. Frederick Montizambert, Quebec, P. Q.
Dr. Samuel Abbott, Wakefield, Mass.
Dr. J. T. Reeve, Appleton, Wis.

The PRESIDENT.—The first report on the programme is that of the Committee on the Pollution of Water-Supply, by Dr. Charles Smart, surgeon U. S. army. (Applause.) (Paper read—see page 62.)

The President.—The matter of pollution of and impurities in water-supply is of so important a character that I hope the members of the Association will assist in the discussion of the question. There are other state boards that have been directly concerned in the practical discussion of the problems Dr. Smart has discussed in his paper.

Dr. Henry P. Walcott, of Cambridge, Mass.—I can very honestly say that I have nothing whatever to add to Dr. Smart's paper. I did not come here prepared to discuss the matter. I did not know what ground Dr. Smart's committee would take in their report. I heartily endorse, however, what Dr. Smart has said, and the only thing I would undertake to add would be a very few remarks in regard to what we have been doing in Massachusetts. I am very glad to say that the work of the board, reported upon in January, 1888, was so far satisfactory to the state, that the board has entered upon another year's work with largely increased appropriations. We practically have nearly $30,000 for the purpose of the investigation. We have established an experimental ground at Lawrence, built artificial tanks of sufficient capacity to test the quality of various soils and constituents of soils, in their chemical and biological relation to waters. These investigations are still going on. We hope to carry them on for a number of years. The report to the board in January, 1889, will contain a great deal of material in a new and more valuable direction than anything we have yet been able to do.

There is one other thing. Dr. Smart insists particularly upon the collection of water in uncontaminated districts. That, of course, in certain parts of the country is possible. In Massachusetts it is utterly impossible. We must understand that in the collection of water from the district in the vicinity of Boston we are taking it from a country where typhoid fever *does* prevail, and, under the ordinary condition of things, there is no reason why the germs of typhoid fever may not enter our water-supply. They do and will enter it until the community goes one step farther, and understands that every case of typhoid fever must be watched, and a proper disinfection, under competent supervision, of all foecal discharges should be made. We must understand that the germ is going to affect our water-supply, and not going to be kept out, unless by a well ordered sanitary police. We must understand that it is there, always ready to pollute the water-supply, and it is our business to keep it out.

Dr. John H. Rauch, of Chicago, Ill.—Mr. President, and gentlemen of the Association: On the 1st of May, the Illinois State Board of Health commenced a systematic investigation of the water-supplies of that state, and of the sources and character of the pollution of its streams. For the purposes of this investigation, samples of lake water were taken every week at Chicago, as supplied from a city hydrant; of water from the Illinois and Michigan canal, at Bridgeport, after it had passed the pumps from the Chicago river, and containing the Chicago sewage; and from the canal at Lockport and at Joliet. Samples were also taken at Chanahon from the DuPage river, at Wilmington from the Kankakee river, at Morris from the Illinois river, and from the Big Vermilion river at its

mouth, from the Little Vermilion at its mouth, from the Illinois river at LaSalle, from the Illinois river at the Henry dam, at the inlet pipe, Peoria Water-Works, from a hydrant in Peoria, and from the Illinois river at Pekin, Havana, Beardstown, Pearl, and at the mouth near Grafton, and from the Sagamon river, at Chandlerville; also water from the inlet pipe of the Alton Water-Works, Mississippi river; from a hydrant in Alton, supplied by the Alton Water-Works; from the Mississippi river near the inlet to the water-works, and from a hydrant in East St. Louis; of the Mississippi river water at St. Louis, after passing the settling basin at the water-works, and from the Mississippi at East Dubuque, Rock Island, Quincy, St. Louis, Chester, and Cairo.

The collection of these specimens closed on the first of November. This investigation covers the Mississippi river, from the boundary line of Illinois down to Cairo, and the Illinois river, with its tributaries from the Wisconsin state line and from Chicago to its mouth. We have also made examinations of the water-supplies of all the public institutions of the states, and of about forty different cities and towns. In addition to this investigation we have also conducted bacteriological examinations of the waters of the Illinois river, especially between Chicago and Peoria. Peoria is 159 miles from Chicago, and is the only city that takes any portion of its water-supply from the Illinois river. We have just closed this portion of our work, and cannot tell definitely the results as yet. The tables are now in process of compilation.

In this investigation you will observe the amount of territory included, and the various factors considered, such as geological and topographical features, the effects of drainage, meteriological conditions, especially as to precipitation and moisture, the pollution incident to population, and more particularly that due to the pollution by the sewage of the city of Chicago. All these factors require to be taken into consideration in the study of the question. This investigation involved also a determination of the rain-fall in the area covered, the amount of water supplied by the tributaries of the Illinois river, the quantity of water in the Illinois river itself, and the quantity supplied by the Illinois and Michigan canal from the Chicago river.

In connection with this last, I have tried the following experiment: In September I directed that the Bridgeport pumps at Chicago should pump only half their capacity, and then doubled the frequency of the collection of the samples between Chicago and LaSalle. The result showed that there was increased pollution of the Illinois river by Chicago sewage. One object of this investigation is to enable us to determine what is necessary in order to prevent the Chicago sewage from becoming a nuisance to the communities below Chicago, and from affecting the potability of the water-supply at Peoria. This question will come up before the Illinois legislature at its next session.

It has been proposed to cut a channel 200 feet in width, 20 feet in depth, with a capacity of 600,000 cubic feet of water per minute, from Lake Michigan to the Des Plaines river, which is one of the streams form-

ing the Illinois. In an examination in which I was engaged about two years ago, I estimated that if 14,000 cubic feet of water per 100,000 inhabitants, were pumped every minute from the Chicago river and sent down by way of the Illinois and Michigan canal and the Illinois river, the sewage of Chicago would not be a nuisance to the city of Joliet, which is thirty-five miles below Peoria, nor would it interfere with the potability of the water at Peoria. At that time we were pumping about 50,000 cubic feet per minute at the pumping works at Bridgeport,—a quantity sufficient to adequately dilute the sewage of only about 350,000 inhabitants, on the above basis.

To those who do not understand the situation, it should be explained that we are attempting to reverse the natural order. What is called the Chicago "Divide" is the natural boundary between the drainage into Lake Michigan on the east and toward the Mississippi on the west. It is only a few miles in extent, and during high water the Des Plaines river overflows into the Chicago river, and empties into Lake Michigan. The territory, including Chicago and its immediate suburbs, of about 140 square miles in extent, is a natural drainage basin, which, with a comparatively feasible engineering work, may be made to drain into the Mississippi by way of the Des Plaines and Illinois rivers, instead of as originally into Lake Michigan, with an occasional pollution of the water-supply of Chicago. Various attempts have been made in this direction, as, for example, the deepening of the canal in 1871, a work which cost the city of Chicago some three million dollars, subsequently, however, refunded by the state after the great fire. The result of this work was not as satisfactory as had been anticipated. Instead of a permanent flow by gravity from Lake Michigan, the varying lake level seriously affected it, silting (?) and consequent reduction of capacity; so that in winter, when the prism and velocity were both still further reduced by ice, not more than 16,000 cubic feet per minute went down the canal. In 1879 I recommended the construction of pumping works at Bridgeport, the head of the canal on the south branch of the Chicago river, estimating at that time that if 60,000 cubic feet per minute should be pumped into the canal, it would sufficiently dilute the sewage of the city, as a temporary, not a permanent, measure. I wished then to tide over pressing necessities; but since then the population in the drainage territory of Chicago has almost doubled,—and it should be remembered that the sewage of Chicago contains an immense amount of material not usually found in city sewage, due to the offal and waste of the great slaughtering industries.

In the investigations two years ago we had a very unusual condition in the absence of precipitation. During the entire period of the collection of samples along the river there was absolutely no rain-fall, and the oxidation of sewage between Chicago and Joliet was much more rapid than anything recorded under similar circumstances up to that time. There was also a continuous high temperature during the period of investigation. During these recent examinations there has been the usual amount

of precipitation, and a summer temperature below the normal, two conditions which will modify the results as compared with those obtained in 1886.

It is my purpose, as soon as the weather admits, to commence another series of observations on the contents of the Illinois and Michigan canal, when the temperature shall be so low as to affect oxidation, and the prism of the canal is diminished by the ice cover. At one time, under these conditions, I detected the presence of Chicago sewage in the Illinois river as far north as the city of Peoria, 159 miles.

Dr. VICTOR C. VAUGHAN, of Ann Harbor, Mich.—Mr. President and gentlemen: I want to say that I heartily endorse the report just read by Dr. Smart. Indeed, I regard it as the most exhaustive report we have ever had upon the subject; and there are some points in it to which I wish to call your special attention. In the first place, chemical analyses of potable waters do not always give us the information which we desire. Such analyses may show the amount of organic matter present with sufficient exactness, but they do not show as clearly as we wish the *kind* of organic matter. Moreover, the results of the chemical analyses depend upon certain conditions, which are often disregarded. I have frequently made a second analysis of a water taken from a jug some days after the first, and have found the amounts of free and albuminoid ammonia greatly lessened. This was due to the process of nitrifaction which had been going on; and, as the amount of organic matter decreased, the number of colonies of germs increased.

In regard to bacteriological analysis, there is the same criticism there is upon the chemical analysis; and I think the criticism is still more important. We know that the majority of germs contained in drinking-water are harmless. We take them in large quantities without their doing us any harm; and this method of simply estimating the number of colonies in a drop of water is almost utterly worthless. The bacteriologist criticises the chemical analysis of water; still they reject or accept a water simply from the number of colonies in a drop. If the bacteriological analysis is to be of value, you must not only determine the *number* of bacteria, but the *kind* of bacteria.

As Dr. Smart has said, those streams which are used to supply us with drinking-water must be kept free from pollution. This can be done in part by forbidding the discharge of sewers into such streams, and in part by preventing the pollution of the soil over which and through which the water passes to these streams.

I suppose you would like to know what we are doing in the way of investigating drinking-water in Michigan. Our last legislature made an appropriation for a laboratory of hygiene which has just been erected, and in which we have begun work. We are now making examinations of drinking-waters for local boards of health, charging them a nominal fee, enough to cover expenses. We are endeavoring to make these analyses as complete as possible. They are both chemical and bacteriological; and by means of slate cultures we isolate the germs and study

each individually. We hope in the course of a few years to arrive at something of value in this way.

We found last winter in the water of a well a germ which we could not distinguish from Eberth's typhoid germ. Thirteen out of fourteen members of the family using this water had typhoid fever. Three dogs were inoculated with this germ. One died on the twenty-eighth day, and post-mortem examination showed ulceration and perforation of the small intestine and enlargement of the mesenteric glands. The second dog died on the thirty-fifth day. In this one the lesions were not so markedly typhoid, but the mesenteric glands were greatly enlarged. The third dog began to recover after the thirty-fifth day. The temperature in the return went as high as 106.7° F. I do not say positively that these dogs had typhoid fever, but the affection resembled typhoid fever more closely than any other disease with which I am acquainted. More experiments will have to be made to decide this point. We do not know positively that the Eberth germ is the cause of typhoid fever.

Dr. Carl H. Horsch, of Dover, N. H.—I regard the report of the Committee on the Pollution of Water-Supply an excellent report. I think the settling of the water is a good safeguard. You take ditch-water; let it settle. Then take a drop from the upper stratum, and you find no bacteria; but dip your pipette down to the bottom, and here you find animals and vegetables living. I think thus far pathogenic bacteria have not been fully determined in drinking-water. We must, therefore, come to the conclusion that chemical changes cause diseases.

The President.—If there are any here not familiar with our methods, I will explain. You have a right to suppose a question-box prepared by each committee. Dr. Smart is chairman of the "Committee on the Pollution of Water-Supply;" and the gentlemen composing the committee are ready to answer any questions that may occur to members, and no one will have any hesitancy in proposing them. Oftentimes a question will lead to a discussion of very great value.

Prof. Geo. H. Rohé, of Baltimore, Md.—I do not think there is any difference of opinion among members of the Association upon the points that are brought to our notice by Dr. Smart. There may be some difference of opinion as to the views expressed by others. The criticism made by Dr. Vaughan upon the methods of bacteriologists are to a certain extent justified, but I think not altogether. He afterwards himself modified the criticism by stating that the sort of bacteria present was the important point, and not really the number. I am inclined to believe, also, that we have some knowledge as to the bacterium which causes typhoid fever.

One point has been overlooked, or not referred to by Dr. Smart in his report; and that is, the danger of pollution of water in transit from the point of collection to the point of distribution for drinking purposes. My friend, Dr. Morris, first called public attention to the method by which the drinking-water of the city of Baltimore is polluted. Dr. Smart has shown very clearly that since a pure supply of water was

introduced into Baltimore typhoid fever has diminished very rapidly. And we believe very firmly in Baltimore that we have a pure water-supply; but it has been shown by Dr. Morris, and afterward by myself, that we have also a method there of polluting the supply between the time it enters the distributing-mains at the reservoir, and the time when we draw it from the hydrant. We have a peculiar sort of hydrant there which we call the "non-freezing hydrant." We are obliged to sink our water-pipes below the surface, and cannot have an open tap outside. The mechanical arrangement of this hydrant,—which I cannot stop to explain just now,—allows after a time, after the instrument gets old, a mixing of the drinking-water, which comes pure from the distributing-pipe, with any sort of polluting material which may gather around the hydrant, where it is sunk into the ground. This has been demonstrated repeatedly by members of my profession in Baltimore. That fact, and other facts that are well known to members of this Association, particularly impress the necessity of disinfection of the excreta, especially of typhoid fever patients; and, if the recommendations that have been made by this Association repeatedly, and by sanitarians generally throughout the world, that typhoid fever excreta should be thoroughly disinfected before they are allowed to leave the room where voided by the patients, were heeded, the mortality from that disease would be immensely reduced.

One other small point,—which is a matter more of municipal pride, perhaps, than of sanitary importance, although it is, I believe, of sanitary importance,—is, that so far as my own knowledge is concerned, during the present or just past season of typhoid prevalence, *every case of typhoid fever which has occurred in the city of Baltimore has been imported from "health resorts."*

Dr. William Canniff, of Toronto, Ont.—As a sanitary worker, I have listened to this paper by Dr. Smart with satisfaction. I wish to refer to two points only. In the first place, the statement has been made that no water is safe to drink into which any sewage is poured. I am not quite clear in my own mind whether the doctor means that it is unsafe to drink water, for instance, from Lake Michigan, into which the sewage from Milwaukee is poured; or, in other words, supposing that all of the cities and towns which at present are draining into Lake Michigan should dispose of their sewage in some other way, except Milwaukee, and Milwaukee should continue to pour its sewage into the lake, would the water be injured for drinking purposes? This is a matter of considerable importance to me and my fellow-citizens in Toronto, because we have to settle this question, How are we to dispose of our sewage, and where shall we get our water-supply? Therefore I have taken the liberty of asking the question.

The next point I wish to speak upon is this: The statement is made that drinking water is the principal cause of typhoid fever. I would like to understand, in speaking of typhoid fever in that way, whether the germs of the disease must come from an antecedent cause of typhoid fever, or whether it is possible to have typhoid fever in a per-

son who had drank water from a polluted well, irrespective of antecedent germs.

Dr. SMART.—The germs of typhoid fever are generally understood to be propagated from an antecedent case; and so far as the argument in the paper of the committee is concerned with the propagation of typhoid, that committee looks upon it as an acknowledged fact that the germs pass into the water. There may be other ways by which typhoid fever is propagated, but the committee has had occasion to discuss the matter solely from this one point of view.

The other point which the gentleman has raised, as I understand it, is with reference to the discharge of sewage into one of our large lakes, such as Lake Michigan. In its report the Water Committee had in view mainly the general water-supplies of the country,—the streams that are dammed up in order to make reservoirs, and the small lakes or ponds, the ordinary sources of water-supply. The large lakes in the country were looked at as destroying the poison by diffusion, just as in a case of typhus there is little danger of infection if you have good ventilation. The poison is lost or destroyed in the immensity of the aerial ocean. If an individual come into the sick-room from the fresh air, he will become infected; but ventilate the room, and you have no more typhus. So we can look at these great lakes as immense water-spaces compared with the small quantity of sewage that is sent into them. These lakes may be regarded as a great ocean, in which the typhoid germs are lost or destroyed. Sewage may turn a flowing stream, if small, into an open sewer, or it may be absolutely lost so far as chemical analysis is concerned, if the stream be large. So in these great lakes the sewage of a city may be absolutely lost so far as propagation of the germs is concerned.

Dr. THOMAS J. TURNER, U. S. N., Washington, D. C.—It may be remembered that Normandy found that traces of sewage contamination were found in Thames water from London as far as the sea, and he believed there were no means of getting rid of such sewage contamination save to take water pure from its fountain-head. I wish to know, in the chemical analysis by which Dr. Rauch determined at a hundred and thirty-five miles the presence of organic contamination,—which is the longest distance I know of where water has been exposed to the influence of the air in removing organic matter,—what processes were used. Frankland found organic matter in water after seventy miles of exposure to air. I am aware that Medlock used iron for the purpose of purifying water. On shipboard water is carried in tanks, and before the introduction of distilled water it generally was in a pretty bad condition in a very little while, especially if obtained from ordinary streams. The introduction of a coil of iron wire, and even the iron of the tank, so far as we are aware, removed a great deal of organic matter. In some chemical investigations the resulting oxide so far resembled the earlier deposition of what is known as "bog iron ore," that what is called by chemists crenic, apocrenic, and humic acids existed in the deposited mass. The

action of the iron was then classed under catalysis. How far must exposure in running streams extend to secure even fairly potable water?

Dr. Rauch.—The examination commenced at Chicago, and continued to Peoria, at eleven different points. At Peoria we took samples of water near the inlet, also from the hydrant. This has been carried on for the summer, and it was hoped in this way to ascertain the effect of pumping in diminishing the amount of organic matter. We took a sample from the Mississippi river at Alton and also at the Island, the day afterwards the same thing at East St. Louis, from the river and hydrant: we took double samples.

We have also, in the course of these investigations, had an opportunity to ascertain the effect of the Hyatt filter. The city of Belleville uses the Hyatt filter, and in several public institutions they use it. I am not now prepared to make any definite statement as to its effect, but may say, so far as my observation goes the result has been favorable.

Dr. Charles A. Lindsley, New Haven, Conn.—I have been impressed by and interested in the paper by Dr. Smart, as well as in the subsequent discussion of the subject, but it seems to me that the thing is simplified too much. Our ideas of the cause of typhoid fever are getting to be almost exclusively confined to the question of water. I do not wish to diminish at all the importance of that question, because I believe it is the chief question in which we are concerned. But are we not limiting our study of the subject a little too closely to that question? I am led to this remark because in New Haven, where I reside, there has been recently an outbreak of typhoid fever. It began, I think, the latter part of September, and continued through October and partly through November, and is still prevailing to some extent, but has mostly subsided now. It was limited almost entirely to one little section of the city, a district containing about four blocks. Careful investigation was made by our health officer there, to determine so far as he could what the source of the trouble might be. He found a great deal of defective plumbing in the houses. It was a poor section of the city, laboring people almost exclusively residing there. There were a few wells used, but most of the families were supplied by the city water, as we call it. Now, this water is distributed equally all over the city; no different sort of water in that place than in the others. Some of the persons who had typhoid fever drank well-water, but the majority of them did not drink well-water; and there was no common cause that could be discovered, as related to drinking-water, that would account for this outbreak. Simultaneously there was an increase of typhoid fever throughout the whole state of Connecticut, almost in every county. We got reports of an increase of typhoid fever through the month of October, a very decided increase in every part of the state, while there was no report whatever of any altered conditions anywhere in regard to water-supply; nor has there been from any source any satisfactory explanation of this very decided increase in the prevalence of typhoid fever. In some towns, where it had not existed before for several years, it broke

out again with rather unusual fatality. In New Haven the fatality was larger than customary before. We have been, up to a recent period, in New Haven, almost exempt from typhoid fever. There have been times when we had scarcely any of it, when for months together it was unusual to find cases. Many practitioners had been in practice for a year or two without attending a case, whereas formerly, thirty years ago, typhoid fever was a very prevalent disease. We attribute the exemption to the introduction of city water, that is, water supplied for the general public, instead of well-supply. I believe there is something else occasionally the cause of an outbreak such as I have described. It does not seem to be due to any special change in the drinking-water. You see it broke out in a narrow district, and was limited to that, its occurrence elsewhere in the city being no more than usual. There is one fact I wish to mention, found to be a fact at that time. A manufacturing company in close proximity to this locality were accustomed to discharge daily into the sewers a large quantity of hot water. It was a dyeing establishment, and the suggestion was made that inasmuch as the germs were propagated most abundantly at a certain temperature, the introduction of the hot water—boiling water—into the sewers created a proper temperature for the rapid propagation of the germs; the germs being so rapidly propagated, were carried by means of the defective plumbing into the houses and residences, and they received the germs by exhalation from the sewer pipes in consequence of such defects in plumbing. Whether there is any reason for believing that theory to be true I am not competent to judge.

Dr. Smart.—I would suggest that the question before the committee was not the cause of typhoid fever, but the influence of sewage-polluted waters. Personally, I recognize the origin of typhoid from other causes than sewage in water. I recognize its origin from an exhalation from the ground, wholly irrespective of the excreta of an antecedent case. I recognize typhoid fever as having occurred in a camp of United States soldiers when there was no antecedent case, and when for seven months the medical officer was perfectly familiar with all the conditions affecting his command. Seven or eight cases of typhoid fever were developed. In one case the post-mortem examination showed the existence of progressive tumefaction and ulceration of the patches of Peyer; in another, the patient was discharged from the service at the end of a year on account of consumption following the fever. There was no doubt as to the character of the disease. The medical officer having charge of the troops had had charge of them during all this time,—seven or eight months,—and knew everything connected with them. The typhoid fever did not come from a polluted water.

Dr. Vaughan.—We cannot be too careful about placing too much reliance upon analyses of the waters of rivers, in determining the distance which sewage will be carried before it is oxidized. In some analyses of the water of a small river a few years ago, I was surprised to find more organic matter in the water taken three hundred yards from

the mouth of a small sewer than in that taken two hundred yards from the mouth. A stream of sewage may flow along in a river as a distinct current for a long distance, and the amount of organic matter found will depend upon whether the sample was taken from the sewer current near it, or distant from it. We know that when the waters of two streams differ in temperature and specific gravity, they may flow side by side, or one in the other, for a long distance without intimate admixture. It is said that the waters of the Missouri and Mississippi can be distinguished one from the other for a long distance below the mouth of the former. In the gulf stream we have a great river flowing through the ocean, due to differences in temperature and specific gravity of the waters.

Dr. Rohé.—How many analyses did you make?

Dr. Vaughan.—I do not remember—quite a number.

Dr. Rauch.—We fully appreciate that there are different conditions under which the water is taken. We also appreciate the influence of the rise and fall, the influence of temperature. For that reason we have continued the examination for six months, the water being taken from the same place, all the way from Chicago to St. Louis, and before the examination commenced I prepared a time-table, indicating the natural flow of the water, and indicating what days the water should be collected, drawn from the current of the river.

Dr. Hicks, of Michigan.—I have been much interested in this discussion. I have been particularly pleased with the remarks of the gentleman from Connecticut. I believe a little as he does about this matter. I have practised medicine in a new country. It has been growing very rapidly. We had a new community spring up in six months. Two or three hundred people built their houses, and typhoid fever broke out before there was any kind of sewage. We would have it on new farms, and we had it every year more or less—some years more, some less. It came at stated times. They drank this water at all times; they did n't wait until the first of August, but drank it in March and April. So it looks to me that the cause of typhoid fever is somewhere else besides in the water; and if the cause of typhoid fever is known, *I* do n't know it. I believe places like this, such meetings as we have here to-day, are capital places to take this matter up, and to find out whether or not we are hunting in the right direction.

There is another question that interests me much. We have a small, rapidly growing town on the shores of Green bay. We take our water-supply from the bay at twenty-two feet depth, out about one thousand feet. We are now putting in a sewage system. We do not know what to do, put our sewers in the bay, or dispose of the sewage in some other way. What is your opinion as to the distance we should go out into the bay for our water, and the depth of water, if we put our sewers into the bay?

Dr. Smart.—I could not tell without an examination of the local conditions, direction of currents, etc. Here at Milwaukee there are said

to be currents which carry the sewage always away from the in-take of the water-supply. I could not specify distances. I do not think it could be done without a knowledge of all the local conditions.

Dr. PINCKNEY THOMPSON, of Henderson, Ky.—I should like to hear a discussion upon the cause of typhoid fever, if anybody knows what it is, but that subject is not before this Association. This discussion is simply water-pollution. I agree with Dr. Hicks, the cause is not known. I am perfectly sure it comes from other causes beside water-pollution.

Dr. J. N. McCORMACK, of Bowling Green, Ky.—Mr. President, I move that this very interesting discussion be brought to a close.

The motion is seconded by Dr. Thompson, of Kentucky.

Motion carried.

THE PRESIDENT.—I wish to give notice that the next meeting for to-day will take place at Plymouth church at 8 o'clock this evening. The meeting to-morrow morning will be at 9 o'clock, and will begin promptly at the time specified. At 12 o'clock, noon, the chief engineer of the city will be here to describe the city water-works and water-supply. He requests the honor of your company, after describing the process he uses, to the works themselves. That will occupy a portion of the afternoon.

Meeting adjourned.

[The proceedings at the evening session consisted in the address of the President and an address of welcome by Hon. John Johnson. (See pages 1 and 28.)]

SECOND DAY.

WEDNESDAY, November 21, 1888.

MORNING SESSION—9 O'CLOCK.

The President being detained at his hotel by indisposition, neither of the Vice-Presidents being present, Col. D. P. Hadden was elected President *pro tem.*, and took the chair.

CHAIRMAN.—We are now ready to proceed with any business that may be before the organization.

Announcements from the Committee of Arrangements by Dr. Martin, commissioner of health, Milwaukee.

Dr. MARTIN.—The only thing this morning will be the order of business, which, I understand from the Secretary, will close probably at 12 o'clock. Carriages will be in readiness for the members of the Association at 1:30 sharp, at the Plankinton House. From that point they will proceed to our crematory, which, we expect, will be running at that hour. From there the drive will be by Prospect avenue to the flushing tunnel, visiting the lake end and then the river end; and I hope during the forenoon, if a few moments can be spared toward the close of the morning session, to hear from our city engineer, who will give a few points in reference to the flushing tunnel.

The SECRETARY.—I have here thirty odd applications for member-

ship. These applications have been examined by the Executive Committee, and recommended to the Association.

Dr. Rohé.—I move that the recommendation of the Executive Committee be endorsed, and that the Secretary be directed to cast the ballot for the Association in favor of their election.

Motion seconded and carried.

The Secretary.—I deposit these names, as the ballot of the Association, in favor of their election as members.

Chairman.—Does the Association desire the names to be read?

The Secretary.—This procedure was instituted to obviate the necessity of taking the time to read the names. They will appear in the public press, and in the Transactions of this Association.

Chairman.—To-day's programme is, first, a paper by Dr. Baker.

Dr. Baker not being present, a paper on "Memoranda of Visits to the Quarantine Stations of the Atlantic Coast," made during the summer of 1888 by Benjamin Lee, M. D., Secretary of the State Board of Health of Pennsylvania, was read by Dr. Rohé.

(During the reading of the paper, and before its conclusion, the Chairman called the attention of the audience to the fact that the time allowed for the reading of the papers (twenty minutes) before the Association had expired, and asked the will of the Association as to whether the reading should be proceeded with. On motion, seconded, the paper was referred to the Publishing Committee without further reading.)

The Secretary.—Dr. Smart desired to make an announcement before the papers were read, and I forgot to mention it. Seeing that a break is made in the discussion of quarantine, it is no more than just to him that he should be allowed to make a remark.

The Chairman.—What is the will of the Association?

(No objections.) Dr. Smart, the Association will hear remarks from you, if you desire to make them.

Dr. Smart.—When I read the report of the Committee on "The Pollution of Water-Supplies" yesterday morning, there was in the possession of a member of the Association a report on the subject of typhoid fever in the city of Pittsburgh, Pa. That report, it seems to me, might come in as connected with the report of the Water Committee. I did not know of the existence of this report until yesterday evening. The Committee on Water-Supply did not bring forward any detailed accounts of typhoid fever propagated by water-supply because these accounts may be found scattered broadcast over the public health reports of this country and Europe. But this Pittsburgh report is current business,—a report of an epidemic that occurred in December last, and, moreover, it illustrates many points touched upon in a general way in the report of the committee presented yesterday. I therefore beg the Association to allow Mr. Crosby Gray, of Pittsburgh, to read a few extracts from his report. It is a capital report, and it ought to be attentively listened to. In fact, Pittsburgh ought to be proud of possessing men who can do such excellent sanitary work as is reported in that paper.

The CHAIRMAN.—What is the will of the Association as to hearing from Mr. Gray a few extracts from that report, as suggested by Dr. Smart?

Dr. SMART.—It will take eight or ten minutes' time.

Mr. CROSBY GRAY, of Pittsburgh, Pa.—It was only at the request of Dr. Smart that I concluded to present the subject at all, and I do not desire to interfere with any of the business or papers of the Association. If these other gentlemen are ready to proceed, I trust you will permit them to do so, and this paper can fill up a gap at some other time.

The CHAIRMAN.—It is the will of the meeting that Mr. Gray read his paper.

Mr. GRAY.—I will be as brief as possible, and will not attempt to read the whole report.

(Mr. Gray reads a paper on the contamination of the south side water-supply of the city of Pittsburgh, Pa., by surface drainings. See page 79.)

The CHAIRMAN.—The next paper to be read is by Dr. Baker, secretary of the Michigan State Board of Health, "Remarks on the Classification of Diseases."

(Dr. Baker, being now present, reads his paper entitled as above. See page 30.)

The CHAIRMAN.—The time will now be occupied by Dr. John H. Rauch, secretary of the State Board of Health of Illinois.

During the reading of his paper Dr. Rauch said,—

In connection with this study of yellow-fever in the United States, I would state that I am now engaged in preparing a table showing the localities where yellow-fever has appeared in this country, from the earliest records; the dates of the first and last reported cases, which will thus fix approximately the duration of each visitation; and, so far as is practicable, the total number of cases and of deaths. This table will cover the Atlantic coast as far north as Portsmouth, N. H., the Gulf states, and the valley of the Mississippi and Ohio rivers. The basis of this table is, of course, that prepared by Dr. Joseph M. Toner, of Washington, in 1873, which has been for the past fifteen years the most complete of its kind, and very well supplements the data on this subject furnished by Hirsch in his "Handbook of Pathological Geography." Dr. Toner's table was compiled with direct reference to showing the influence of elevation upon yellow-fever, an influence which has since—and largely owing to Dr. Toner's work—been proved to be of only relative importance.

The purpose of the table which I am preparing is to show what effect local meteorological conditions—at least those of temperature and moisture—have upon the propagation and spread of yellow-fever. To this end I am also preparing charts of the mean temperature of seventy degrees Fahrenheit, and upwards, for the months of May, June, July, August, September, and October, the months in which yellow-fever has made its appearance in different sections of the United States. After this table and the charts are compiled, they will materially assist in

determining at what places and under what meteorological conditions yellow-fever may be introduced and spread in this country. This will enable us to say authoritatively when quarantine is or is not necessary, and so aid us in establishing practical measures, and preventing a repetition of the useless, unwarrantable, and illegal quarantines which have spread panic, demoralization, and untold suffering through a large extent of our country during the past few months.

If such information had been generally accessible, and its meaning and purpose had been definitely understood, we would have been spared the deplorable incidents witnessed at New York and elsewhere, the result of causeless, not to say inexcusable, fear and apprehension. There might have been some justification for the action in Prof. Proctor's case had it been small-pox. In fact, the measures of isolation, etc., enforced in that case, would have been clearly necessary in a case of small-pox, but they were wholly inapplicable and unnecessary in such a disease as yellow-fever in that latitude, and with the temperature which there obtained.

No less indefensible were the quarantines established and enforced—with shocking barbarity in many cases—throughout the South, in localities far from the infected territory, and where a study of the daily temperature records showed how remote the possibility was of any spread of the fever, even though it might be introduced by refugees.

I may say here that my efforts during all this period were devoted to allaying these panics, to obtaining a modification or abandonment of the quarantine, and to opening up avenues of escape for the refugees from the infected localities. I was working directly in the interest of humanity, and the only sanitary business in which I was interested was the rapid depopulation of the infected places, feeling absolutely assured that, from the conditions which obtained, nothing more could be done, nor was necessary. I was especially gratified at the action of the authorities at Louisville in throwing open its doors to the refugees, and on receipt of the telegram from the mayor announcing this action, I replied congratulating him on this wise and humane action, at the same time saying there was no danger of the spread of yellow-fever in Kentucky. The same confidence inspired my refusal to grant the request of the Cairo authorities for the aid of the state board of health in maintaining quarantine at that point.

I have already shown in the text of the paper read my reason for this confidence. I must confess, however, that I was not a little disconcerted at the receipt of the dispatch announcing a suspicious case of yellow-fever in Memphis. It caused me to hesitate in taking summary action to break up the quarantine restrictions in southern Illinois, but my direct communication with the authorities of the taxing district soon corrected the erroneous report. The president of the district, Mr. Hadden, can give you the details of the case.

This prompt and conscientious action of Dr. Thornton at Memphis was in striking contrast with the conduct of the authorities in Florida.

Dr. Jerome Cochran, at Decatur, Ala., and Dr. Wirt Johnston, at Jackson, Miss., also kept faith with the people of the valley, and kept sanitary officials and health authorities everywhere fully advised of the exact status of affairs. Too much praise cannot be accorded to these gentlemen. As chairman of the Quarantine Committee of the International Conference, I was kept fully advised of every development in the territory affected and threatened, and every evening I knew the exact situation, and had perfect confidence in the reports. There was no attempt at disguising or concealing the truth.

(For Dr. Rauch's paper see page 136.)

Dr. V. T. Atkinson, of Milwaukee, Wis.—I would like to repeat an announcement made this morning before all the members of the Association were present. At 1 : 30 P. M. there will be carriages in waiting at the Plankinton House for the accommodation of delegates and their ladies, to drive to the flushing-tunnel and water-works. I am also asked to say that the "Woman's Club" of Milwaukee will give a reception to the members of this Association and their ladies at this place this evening.

Dr. Plummer, of Rock Island, Ill.—In regard to one statement made in Dr. Rauch's paper of "yellow-fever." I understand he states in that report that no case of yellow-fever had been known to originate in the state of Illinois north of Centralia. The Doctor is mistaken in that, if I understand him right. About the first of August, 1854, a case of yellow-fever was landed from a steamboat at Rock Island—a far advanced case. I attended the patient until he died. The nurse I employed contracted the disease from that patient, and so also a young man who had been assisting in taking care of the patient. The nurse died, the young man recovered. Those two cases originated from contagion at a greater altitude and greater northern latitude than the case reported by Dr. Rauch.

Dr. Rauch.—I have no hesitation or difficulty in accepting the statement of Dr. Plummer. The language in my report is to the effect that we have no record of any case of yellow-fever originating in the state of Illinois north of Centralia; and I do not understand Dr. Plummer to say that the cases which he now reports have ever before been made the subject of record.

As a matter of fact, cases of yellow-fever are known to have been brought into Chicago during the construction of the Illinois & Michigan Canal; but these also have never been, to my knowledge, formally recorded. At the date of which Dr. Plummer speaks, the conditions of travel were very different from those which now obtain. A long, slow journey on a badly-ventilated steamboat during intensely hot weather might very well have intensified the virulence of the poison so as to infect attendants on yellow-fever cases landed even so far north as Rock Island. It would be interesting to know what the average temperature was during the month of August, 1854.

Dr. Plummer.—The cases I speak of were probably similar to those carried into Chicago from the Illinois & Michigan Canal; and I only

wish to make the point that, under certain conditions, the disease may be communicated to residents of places as far north as Rock Island.

Dr. RAUCH.—Cases of yellow-fever occasionally originated in Illinois, north of Centralia, in the early history of the state.

Dr. WILLIAM BAILEY, of Louisville, Ky.—I desire simply to occupy five minutes of your time confirmatory of the views expressed by Dr. Rauch in his able paper just read to us. In order to do this I will very briefly narrate the history of yellow-fever in my own city, Louisville, Ky.

During the epidemic of 1878 Louisville opened wide her gates and extended cordial welcome to all refugees fleeing from yellow-fever or from infected districts. At that time many of us did not believe that we were in the slightest degree in danger from cases of yellow-fever that might come to us. Refugees flocked to our city by the thousands. No doubt as many as ten thousand came, some of them passing further north. They occupied our hotels, boarding-houses, and private residences, in person and with baggage, from cellars to garrets, during the entire season. We found it necessary to organize what was called a yellow-fever hospital, in which were treated about 100 cases.

A resident physician was appointed who constantly lived in the hospital and supervised all its affairs. He daily, and almost hourly, made minute examination of all excreta, both chemically and microscopically, and, in addition, made ten or twelve critical *post-mortems*. He was assisted by a large number of physicians and nurses, the corps numbering about thirty persons. In addition, many other physicians, ministers, and charitable women were in daily attendance, ministering to the wants of the sick. No restrictions whatever were placed around these patients to prevent them from communicating the disease. So far as we were able to learn, there was not a single symptom of yellow-fever in any of these persons in such intimate contact with these cases for a period of six weeks. This season, after learning of the fever at Decatur, Ala., and of the difficulty its citizens found in getting to places of safety, our mayor (who, by the way, was mayor of the city during the epidemic of 1878) called a number of us to his council-chamber to determine what should be done. Remembering our former experience and the lateness of the season, we decided again to extend to these afflicted people, with whom we greatly sympathized, an invitation to come to us; but this invitation was made somewhat conditional, basing the modification upon our experience in 1878, which was separate from and additional to that already given in relation to our hospital.

During the epidemic of 1878, at the L. & N. R. R. depot in our city, baggage accumulated, and cars from the infected districts were allowed to remain, and within a square or two of that depot an evidence of genuine yellow-fever occurred among our own citizens who had not been near the hospital, or any cases of the disease, as these were removed to the hospital from the trains before they came within two miles of the depot. About thirty or forty of our citizens within this limited area had the disease.

We were constrained to believe, from the experience of 1878, that more danger existed from cars, baggage, etc., than from the persons of the sick, and hence this year we said,—"Come and welcome; but so far as possible bring no baggage. We prefer to buy you new clothing when needed than to take the risk from that you may bring with you." Climatic conditions have much to do with the development of this specific cause when introduced; and, believing that these were such as to reduce our risk to a minimum, we said "Come."

We received two sick with fever from Decatur, unfortunately both to "hospitable graves" as well as to "open arms," as they both died with black vomit, etc., indicating the severity of the disease. Our conclusions are in accord with the paper read by Dr. Rauch.

Dr. SALOMON, of New Orleans.—I have been much interested in the paper of Dr. Rauch. He has shown you how communities in which there was the least possible danger of communication of the disease became panic-stricken, while in others, particularly in New Orleans, where we had everything to fear, there was less panic than in almost any other city of the United States. This, I think, was due to a large extent to the cool front displayed by the health officers. My office was a perfect pandemonium from the time of the announcement of the cases at Jackson, for a period of two weeks. The office was crowded with merchants and other people coming in and wanting this and that and the other thing done. They were informed that the State Board of Health of Louisiana knew their duty, and proposed to perform it to the best of their ability. We were satisfied we were taking every precaution against the spread of the disease. Our state board of health was in session at the time of the announcment of the cases of yellow-fever at Jackson. The board was in session when the telegram of Dr. Wirt Johnston was received, at half-past eight. Before two o'clock in the morning, with the assistance of Dr. Watson, we had our inspectors placed on every railroad leading into New Orleans, from every direction, for the purpose of preventing people coming from Jackson and other infected districts into the city of New Orleans. We had previously had inspectors on the roads leaving Florida. The consequence was we were as well protected as possible under the circumstances. We were not afraid of the introduction of yellow-fever into New Orleans. But a large number of persons asking us to be allowed to come from Florida, we told them they might come if they would come to our quarantine station; they would be allowed to come just the same as we were receiving people from Havana. There were several refugees from Jackson arrived in New Orleans immediately upon the announcement of yellow-fever. We were fortunate in escaping the manifestation of anything that looked like yellow-fever.

To give you an instance of the "panicky" condition that was on the verge of an explosion, I would state that it was on Thursday night that Dr. Wirt Johnston's despatch was received. Of course it required a good deal of work and energy to get our inspectors on trains, and to see

all the railroad officials that night, and have everything in readiness for thorough inspection on the railroads the next morning. In the meantime a circus troupe that had been performing in Jackson arrived in New Orleans. My office was besieged. "Do you know that a circus troupe has arrived from Jackson in New Orleans?" "Yes, I know that —I know their names; but that is not going to do you any harm." "But they ought not to be allowed." "Well, gentlemen, it has been allowed. What do you propose to do? If you can suggest anything we can do, I am willing to act upon your suggestion. We are satisfied this circus troupe has not been in contact with any case of yellow-fever, and shall allow them, under observation, to remain here." No one contracted the disease from them.

We also had refugees from Jackson, two of them, particularly, who had been in actual contact with cases of that disease. These two men were telegraph operators, and boarded in New Orleans. On the Friday following the day of the announcement of the disease in Jackson I was informed of their arrival, and for the purpose of preventing any panic, creating any alarm, I sent a sanitary police officer to the house where these men were boarding, and had them brought to my residence,—not to my office, I did not want them there,—in the afternoon. These men both presented certificates to the effect that they had not been in contact with any case of yellow-fever in Jackson signed, "Wirt Johnston, Secretary State Board of Health, per"—some one else. I have since been informed that he knew nothing about those certificates. These men were informed that they were going to be sent to the quarantine station; it did not make any difference what story they told; they had to go there and have their baggage disinfected. They then informed me that they had both been in the room where a case of yellow-fever had occurred, and had helped take care of the sick man.

A health certificate was issued from my office, under my signature, to a party who wanted to leave New Orleans. He said he was going away. This man had resided in New Orleans. He went a little way up the Jackson Railroad and sold his certificate to a man who went to Vicksburg. He happened to be known in Vicksburg, and the Vicksburg authorities accused me of issuing a certificate to a man from Jackson. The president of our state board of health informed me, on his return from his conference in Nashville, that at a number of stations on the road between Nashville and New Orleans there were men standing on the platforms hawking health certificates. Any one could purchase one. Therefore I believe with Dr. Rauch, that the only method of preventing panic, or getting people to act sensibly in all this panic, is concert of action. It is noticeable that all the state boards of health represented in the Sanitary Council of the Mississippi Valley, acting in concert, placed complete reliance upon each other. Information was asked and freely given, and the health officers themselves were free from panic. There were police juries, and mayors, and councils of towns that created all the panic. There is where all the trouble was.

And to give you another instance. A few days before the announcement of the cases of yellow-fever at Jackson, Miss., New Orleans was astounded,—the state board of health and the community,—to hear that Texas had quarantined against New Orleans. Dr. Rutherford had not asked us for any information, and we were in the dark as to where he obtained his information in regard to yellow-fever in New Orleans. There was an indignation meeting called by the Chamber of Commerce and different trade organizations. They passed resolutions denouncing the health officer of Texas, etc. The governor of Texas was telegraphed to, asking why they had quarantined against New Orleans, and if it was reported that there was yellow-fever in the city, to please give the names and location of the cases. The governor, through his private secretary, telegraphed to me the location of the supposed cases. Immediately upon the receipt of the telegram from the governor of Texas, I made an investigation. I found in the first place that the cases were located in almost the two extremes of the city, probably about five miles apart,—one on Tchoupitoulas street, giving the number. It was found, on going to that place, there was no such number; that the number which would have corresponded to the number given was found to be in the middle of a square, where there is a cotton yard. In the lower part of the city there was no such number, and the number which would have corresponded was in the middle of a vacant square. I do not know who Dr. Rutherford's informant was. That shows upon how slight and unreliable a report one state can quarantine against another. Steamships were stopped, trains were stopped, and passengers put off at the state line. This lasted for two or three days. I went and saw the governor of Louisiana and laid the case before him, and had him lay it before the governor of Texas, and within forty-eight hours the quarantine was removed. For three days it existed, and, as you can imagine, with great loss to the trade of New Orleans. I had been constantly answering telegrams denying rumors that there was yellow-fever in New Orleans. But upon the action of the health authorities of Texas, my replies to those telegrams were hardly believed; and it was with great difficulty we could make people believe there was no yellow-fever in New Orleans, because Texas was so close and had declared quarantine against us.

Therefore I think there ought to be such a system of concert of action between state boards of health as will prevent senseless quarantine and creation of panics in times of epidemic in other portions of the country, or in times of threatened epidemic.

Dr. Pinckney Thompson, of Henderson, Ky.—The last meeting of the Sanitary Council of the Mississippi Valley was at New Orleans, and it was solemnly agreed that all the state boards of health bordering on the Mississippi river, including the Mississippi valley, should report to all the other boards, municipal and state, whenever a suspected or actual case of yellow-fever should occur in their midst, and up to last year it has been faithfully complied with. I am sure that agreement has never been discontinued. It is true there has been no necessity for calling a

meeting of that council for several years, from the fact that there has been no yellow-fever in the Mississippi valley with the exception of a few cases at Jackson, Miss., last September.

Dr. SALOMON.—We want other states, not represented in this conference, to come into the organization. Texas has no state board of health. True, as Dr. Rauch very properly said, if Florida had had a state board of health there never would have existed that state of things.

Dr. THOMPSON.—They could not make Florida have one if they did not want one.

Dr. SALOMON.—Then we want the health officer of Texas to come in accord with the other states represented in this conference.

Dr. THOMPSON.—I agree with you perfectly, sir, that concert of action is desirable. I believe you will agree with me that during 1879, and for years afterwards, the Sanitary Council of the Mississippi Valley accomplished more than any other organization in this country, and it had not a dollar, nor did it have a law in force either; it was simply by that concert of action. The whole action was carried out, and, in addition, it was in that council, and in that concert of action, that all the rules and regulations afterwards issued and promulgated all over this country by the National Board of Health were inaugurated.

Now, sirs, as to this quarantine matter. I do n't know whether to reply to Dr. Rauch's paper or speeches. He seemed to me much like the boy, after a thing had transpired, saying, "I told you so." I am not one of the men that blame people for becoming panic-stricken. I only wonder that they are not more so. I do think in these quarantines there is much cruelty practised, and it is always executed by some fellow who is not panic-stricken. You take a health officer who thinks he has the wisdom of the world (like many people), and if he would only devote himself to carrying out the common-sense rules and regulations which were so faithfully and honestly executed by our friends in New Orleans and elsewhere, in 1887, I think these barbarities would cease.

I do n't know that anybody has ever settled how yellow-fever is communicated. I am one of the persons who do not believe that it can be communicated at all by personal contact. In my judgment, you may stand without clothing and touch each other, and it would not convey the fever; but it is always from the fabrics that it is communicated, as was so ably illustrated by Dr. Bailey's statement of the existence of the fever in Louisville, Ky., in 1878. I will ask the doctor if he remembers how many original cases he had.

Dr. BAILEY.—Thirty or forty.

Dr. THOMPSON.—That epidemic was propagated by the baggage and sleepers about the depot. This year, taking into consideration the lateness of the season, temperature, &c., there was no necessity for a quarantine in any part of Kentucky, and consequently we did not institute one.

The first man that died in Decatur was not the first case. They never

suspected that he had it until he died and it was demonstrated it was yellow-fever, and the official announcement of that fact caused the people to become panic-stricken. It might be said, Isolate those cases, keep the well from the sick, and it would not spread in places like Decatur; but that is about as difficult as to prevent one of those panics. If those people had not fled, there would have been a thousand cases instead of one hundred and fifty. It would have been the same at Jacksonville. The same thing occurred in Hickman, Ky., in 1878, where I believe about twelve or fifteen people died before they could depopulate the town. The only way you can control the yellow-fever is to depopulate a place. I believe that Illinois and Kentucky, and I will say Missouri, ought to have some place where these people could be sent free of charge. These states have plenty of soil where yellow-fever could not be propagated.

Dr. Horsch.—Mr. President and Gentlemen: With due deference for individual opinion and experiences, I wish to state that in the first place those efforts are based upon a scientific investigation: and, secondly, they are just as much for the benefit of the patients as for the community. Therefore we ought to put off all prejudices and aid in this excellent effort, and establish an interstate quarantine coöperative with the United States, on a truly scientific, rational, and common-sense basis.

Dr. Salomon.—I may be permitted to say a few words in reply to Dr. Thompson. I did not say there was any lack of concerted action between the state boards of health. I wish to emphasize the fact that there now exists perfect concert of action between the various state boards of health of the Union, particularly of the Gulf states and the states of the Mississippi valley; that each state board of health represented in that section of the country has perfect confidence in the integrity of the other boards; that any information that one board of health may give to the other is considered as perfectly reliable. I said what I did simply for the purpose of emphasizing the importance of this concert of action between state boards of health, and we in Louisiana still maintain the position that we will always notify other state boards of health of even a suspicion of yellow-fever in New Orleans, or anywhere in the state of Louisiana. Upon that, gentlemen, you can rely.

Dr. John Gauntt, of New Jersey.—I happen to live, geographically, between Philadelphia and New York, two very populous cities. At one time our place was the resort for refugees from yellow-fever. Thousands of people arrived, and many died; so we have never considered ourselves quite beyond the range of yellow-fever. I believe any gentleman who has given the subject as much attention as Dr. Rauch has, knows more about yellow-fever and where the boundaries should extend than anybody else. But we in New Jersey, bounded as we are on either side by two great cities, believe it is to our interest to see that this disease does not come within the danger line; therefore we have established this quarantine, and instructed these men to be strict in attention to

duties. I do not think we have lost anything by it, or ever will, and I should be sorry to see any opinion go out from this meeting calculated to set the minds of the people in the direction of disregarding quarantine. The month of September is with us often much warmer than any other month of the year.

Dr. RAUCH.—It is not the question of quarantine; *useless and unnecessary* quarantine I am talking about.

Dr. GAUNTT.—I am talking about the usefulness of it. It is useful to us,—even in September it is over one hundred at times, nights often over eighty, and averages as high during September as any month in the year,—if temperature has anything to do with this poison. But as you are talking preventive, I think you had better inquire if you have seen it, and what it is you are dealing with. People who talk about poisons have seen them, they know them by some chemical test, or their appearance, or something of that kind. But the question is, whether yellow-fever is a growth; is something in your skin, or out of it; in your clothes, or out of them; or is it a vegetable organism, a plant—a tropical plant—governed entirely by the temperature of the tropics? If diseases are analogous, why yellow-fever must have its specific origin and specific growth, that only come from temperature and circumstances favorable.

Dr. SAMUEL P. DUFFIELD, A.M., PH.D., Detroit, Mich.—A gentleman by the name of Thompson, of Kentucky, made one strike with his broad-sword that made it a double-edged sword. In other words, he attempted in that one sentence to lay down a certain principle that destroys all we know from medical books on the subject of yellow-fever. I think it is a dangerous thing to assert that the baggage and the clothing are to be disregarded as carrying the fomentes of yellow-fever.

Dr. THOMPSON.—That is just the thing I did not say. I said it was the only thing that *would* carry the poison. I said I did not believe it could be conveyed to us by personal contact; that I believed it was carried in fomentes.

Dr. DUFFIELD.—Do you believe the skin carries it?

Dr. THOMPSON.—No.

Dr. PERKINS, of Schnectady, N. Y.—This question of quarantine and the necessity of it—Dr. Rauch speaks of temperature. I do not know how it is out West, but we have with us, about New York and New Jersey, and the shore line of Connecticut, about the first of September, almost always a warm period where the temperature will go up often to July heat,—an extremely moist temperature; everything is damp. Come into a room, and the walls are moist when not exposed to the sunlight, or directly to the air: you can rub the moisture off with your fingers. And my experience is, that the yellow-fever we have had in my native place—the most dangerous and disastrous period—was there after the first of September. Now, we can tell, of course, if the temperature is below a certain point, why this won't go on. But we cannot tell—that is, I don't know how your weather is here—what the morrow will bring

forth. We may have say a coolish day, when we take a spring or summer overcoat, and we wear it, and that will be followed by a week so warm as to be uncomfortable; and it is at this time, it seems to me, that all these germs or fomentes would be the most likely to grow; that is, they would be surrounded by moisture, or have moisture, which is necessary to the carrying on of all life, and they would germinate.

Dr. GAUNTT.—I would ask if it is not a well known and recognized fact that not only heat, but heat and moisture, are required for propagating yellow-fever; and if so, if it is not an acknowledged fact that the month of September throughout the world is about the most unhealthful of the whole year. I believe that heat and moisture are one of the influences, certainly a propagating influence, in increasing yellow-fever.

Dr. McCORMACK.—I would like to move that the Secretary of this Association be requested to put in type the paper read by Dr. Smart yesterday, at as early a date as possible, in order that those state boards of health desiring to do so may be able to secure copies. The State Board of Health of Kentucky desires to have a number of copies, and I have heard the same desire expressed by quite a number of states. I would like to submit that motion.

The CHAIRMAN.—There is a motion before the Association that the paper read by Dr. Smart yesterday be submitted for publication as early as possible, and a distribution of copies be made to the various state boards of health. That is a question that has to be submitted to the Executive Committee.

Dr. THOMPSON.—The state boards of health can order any number of copies they like at their own expense.

Dr. McCORMACK.—This is not a resolution under the by-laws to go to the Executive Committee. It is a motion that can be acted on now, and I call for the question. It is simply a request. It will be a private arrangement so far as each one of us is concerned.

Motion being seconded, was put and carried.

The CHAIRMAN.—Various papers will be read and illustrated before this Association at 4 o'clock this afternoon. This evening, I believe, there is an entertainment here at 8 o'clock.

Meeting adjourned.

AFTERNOON SESSION—4 O'CLOCK.

Meeting called to order by the President.

The PRESIDENT.—The first paper this evening is on "The Canadian System of Maritime Sanitation," by F. Montizambert, M.D., quarantine officer at Grosse Isle, St. Lawrence river. (See page 116.)

This paper was illustrated by stereopticon views, with the assistance of Dr. McIntosh.

On motion of Dr. McCormack, at the conclusion of the reading of the paper, a vote of thanks was tendered Dr. Montizambert "for his able paper and the illustrations that accompanied it."

Paper on "The Quarantine System of Louisiana, and its Improvement," by Lucien F. Salomon, M.D., read. (See page 110.)

Dr. S. H. Durgin, of Boston, Mass., then read a paper on Quarantine. (See page 134.)

"Garbage Furnaces, and the Destruction of Organic Matter by Fire," by S. S. Kilvington, M.D., president of the Minneapolis Board of Health. (See page 156.)

Dr. Oscar C. DeWolf, of Chicago, Ill.—I think we must be congratulated. We have listened to the most comprehensive paper on this subject ever given in this country, connected with the illustrations. This garbage question has been an annoyance to all men who have had anything to do with the administration of health affairs in cities. Chicago—to be brief—erected a furnace this year in February, which has been illustrated here. I have believed that the proper method to dispose of the refuse of a great city is to burn it. I have entertained the view which the orator has presented to-night, that the proper disposition of this refuse was destruction. I have changed my view somewhat, and I want to tell you why. From an economic stand-point, from the sanitary stand-point, the proper idea is to utilize this refuse—always under sanitary conditions—to return that to the soil which you take from it. Chicago erected this Mann furnace at a cost of $11,000; we can erect one to-day for $7,000, as we have our patterns. We are able to burn in this furnace 150 tons of garbage per day, and do it at an expense of 17 cents per ton. Our coal costs us $3.73 a ton. We have not been able for a long time to run our furnace to the full extent; the expense of the long haul of garbage has made it practically impossible. We have burned 103 tons a day for 26 working days, that costs us 25¼ cents per ton. That perhaps is all that is necessary to say of the operation of our furnace. It has cost us nothing for repairs during this summer. The destruction of garbage by fire is an illustration of the economy of extravagance. That is, it has to date been economical to destroy that which had value. It *has* been economical. I have never doubted that the day was coming that the last expression of sanitary science on this point must be this: the economic question. I have never doubted that the day was coming when this material was to be utilized, and the two visits I have paid to Buffalo during the last month, the two days spent there at intervals of a fortnight, have been to me a revelation. While the consumption of garbage has cost us, in the most economical manner we could destroy it, from 17 to 24 cents per ton, it is proposed now to treat this garbage at a price two thirds less than this, and every element of the garbage which is valuable to the soil, or for any other purpose, returned to us. Now, I was so much interested in this matter, that I asked these gentlemen to present to this society their plans. They have their engineer here; they have their most accomplished chemist, and the accomplished health officer of Buffalo, under whom this plant and this apparatus in Buffalo have been constructed, and I beg you to listen to them. I am sure they will interest you very much. Taking 100 tons of

crude garbage, driving 60 per cent. of water from it, taking from the remaining mass of 40 tons 10 per cent. of oil, worth as much as tallow within half a cent a pound, and the mass remaining worth just as much as it contains units of ammonia, potash, bone-phosphates,—their product worth from $6 to $12 a ton. It rivals the proposition presented by the orator this evening of the destruction of refuse by fire, and will challenge the thoughtful attention and interest of sanitary authorities everywhere.

Dr. Kilvington.—In my last annual report I admitted that it is very wrong to drain the materials which should be used as the life-blood of the soil into the rivers, as we have been doing. The question that Dr. DeWolf has raised, and which the description of the apparatus of the Buffalo company emphasizes, is that of the manufacture of fertilizer, rather than of the disposition of refuse. As I understand it, the Murtz Destructor is not in any sense a crematory, but a device for distilling from certain kinds of refuse the essential oils contained therein. As such it does not fairly come under this consideration of the destruction of organic matter by fire.

We know that fertilizer can be obtained as the product of the combustion of waste materials, but after the fertilizer is made, the question in our part of the country is, What are you going to do with it? I have in my city 1,200 loads of manure to-day that we can 't dispose of profitably. There is a factory of fertilizer in operation there, creating the most damnable nuisance in the city, and there they have commonly a hundred loads of fertilizer that they can 't get rid of. We should be in the same case if we adopted a system merely for the sake of making fertilizer. I believe that fertilizer can be made indirectly and utilized, but it will always be a question for a health officer to determine what to do with the stuff after it is on his hands. Oil can be sold, for that belongs to a class of material that can be utilized in the mechanical interests of the country, but when it comes to the disposal of manure, or solid fertilizer, it is a question as hard to solve as the disposition of the waste material itself. Cities must look at this matter, not from the stand-point of a financial investment, but from that of a sanitary measure.

Dr. Perkins, of New York.—Perhaps it may be interesting to a good many of you to know what we do with a horse at Brooklyn. A horse is found in the street in Brooklyn, dead. He is taken over to the crematory. First his tail is cut off, and his mane. His hoofs are taken off and made into glue, his hair is used in mattresses and cushions; his skin is taken off and tanned. He is then dumped into a big retort, closed in and steamed with hot water. The gases pass over the fire and are burned. He is turned out, and the meat is worked off, put into bags and strained, and the grease, perfumed with four or five different kinds of perfume, is used for axle grease. The meat is made into dog biscuits; the big bones make your nail and tooth-brush handles. The bones are then burned in retorts, sifted and broken up, and the bone-black is used to clarify your sugar, and the small bone-dust is used for a fertilizer.

Dr. Edward Clark, health officer of Buffalo, N. Y.—I wish to say a few words respecting the disposition of garbage in the city of Buffalo. You all know the geographical situation of Buffalo. For a good many years the city has been in the habit of having the contractor dump garbage into Niagara river. There was objection made, and six months ago it had to be stopped. The city enacted an ordinance regulating the cleaning of the streets, and the removal of all swill and garbage, and there was a specification in the contract which requires the contractor to dispose of the garbage in such a manner as shall be approved by the board of health. When they stopped dumping garbage into Niagara river, the next alternative which presented itself, of course, was the cremation of garbage. As Dr. DeWolf says, the great question is that of the economical disposition of garbage. It may not be necessary now in your great wheat fields of the West to use fertilizers, but the day is coming when you *will* use them.

A committee went to Montreal to examine the Mann furnace. We decided we did not want it. The next question was, What was the next best thing to do? We had heard that in Europe a gentleman had a patented instrument for the disposal of garbage. A person went to Europe and examined this concern, and after two years of experimenting it has become so perfect that it is now controlled by a certain individual, who has the exclusive right to operate it throughout the United States. It is known as the Merz patent. We take the garbage, and out of 100 tons of garbage drive 60 per cent. of the moisture; the rest of it is passed into a receiver, and a solution of chemicals is introduced into it by automatic arrangement, which extracts every particle of oil, leaving a dry and odorless residue. The oil is a valuable product, and the other dried product we have is used as a fertilizer. Now, the question has been raised, What are we going to do with the fertilizer? We do n't have any trouble in getting rid of it in the East. If we cannot sell the fertilizer at all, we can use it for fuel, as it makes the very best material for producing heat in the furnace; and the oil alone extracted by this process will more than pay the expense of the disposition of the garbage. The engineer who has had charge of the construction of this furnace is present, and will perhaps say a few words as to the mechanical working of the Merz Extractor. Here I show you a sample of the refuse which comes from the extractor after the oil is removed. Before this machine was erected in the city a good many people objected on the ground that they thought it was going to be a nuisance. The common council appointed a committee from their body, and that committee was accompanied by myself and the city engineer, and we examined this plant as to whether it was going to be a nuisance or not. I will read a printed copy of the report which they made to the common council. (Report read.) I firmly believe that any one who sees this machine in operation will go away convinced that the day of the garbage crematory, or destruction of garbage by fire, is rapidly passing away.

The President.—What kind of garbage do you dispose of?

Mr. Clark.—Ordinary garbage such as is usually collected in cities. We do not dispose of night-soil. In our city we have an ordinance which requires the people to keep garbage and ashes and night-soil separate, and we get the garbage almost entirely free from ashes. I believe the day of the garbage crematory, or destruction of garbage by fire, is rapidly passing away, and I venture to say you will see a great revolution in this respect in a very few years; and after the health officers of the different cities take pains to investigate the different methods for disposing of garbage, I do not believe you will find many garbage crematories in existence.

The President.—What do you do with night-soil?

Mr. Clark.—A number of licensed individuals collect the night-soil. We have not a great many buildings to collect from. We have an intercepting sewer, which empties into Niagara river three fourths of the night-soil; the rest is collected and disposed of outside of the city; it is dumped into pits and mixed with earth by farmers, and used as fertilizer. We find it necessary to use fertilizers in the East very freely.

The President.—What do you do with the manure?

Mr. Clark.—Farmers drive into the city and pay us a dollar a load for it. Street sweepings do not go into the garbage; this is used in filling lots; it is a perquisite of the street contractor, who sells it.

The President.—All you dispose of in this furnace is what you call garbage?

Mr. Clark.—Yes, sir.

The President.—How much of that material do you get during the year at Buffalo?

Mr. Clark.—We are now disposing of about eighteen tons a day.

The President.—What is your population?

Mr. Clark.—About 250,000. This machine has only been in working order six weeks or two months. The quantity is increasing almost every day; the people begin to find out, and the contractor as he goes out around tells them to save their garbage. A good many people formerly burned their garbage themselves in Buffalo.

Question.—Do you get any grease out of any material except the bones and meat?

Mr. Clark.—We get all the grease there is in the garbage; everything is dumped into the dryer promiscuously,—dead chickens, feathers, bones, meat, and everything else.

Question.—Would that material, after the grease is extracted, burn any better than if reduced to charcoal by any other process?

Mr. Clark.—Perhaps not; but we are arguing from the economical stand-point. Every furnace that I have ever seen is an expensive affair. We destroy garbage for nothing; it will pay for its own destruction by this process.

The President.—The company are doing this, and charge the city?

Mr. Clark.—No, this garbage can be destroyed for the products we get from it. The street contractor is obliged to do this, and it must be

done subject to the approval of the board of health. The city has nothing to do with that part of it, and the city does not own the plant. As I say, this plant was constructed by a man who has the exclusive right to operate it throughout the United States. The contractor of our city has made arrangements with him for disposing of this garbage. You could have it running on the principal streets of our city without being a nuisance, except drawing the garbage there. The garbage is put into a dryer, and from that time on there is no nuisance connected with it.

Question.—What do you do with the dead animals of your city?

Mr. CLARK.—They go to the rendering works.

Mr. PRESTON.—The process is very simple of disposing of garbage. This sketch is very crude. There should be a floor here. We introduce the garbage into our dryers here through these pipes, which have sealed joints, and expel the moisture; here it is condensed, and the remaining gases pass from here under our boiler fires. This floor acts as a foundation for our boiler fires. After we have expelled all the moisture, the material is positively dry; we discharge it here; take it to an elevator; pass it through an elevator into our extractor. It is treated with benzine. The grease and oil are separated. There are two compartments here not shown. The oil passes down to the floor compartment, and the benzine passes again into a storage bin—which should be above this—ready for another charge. We open this door, take out our material; it comes out very dry; we pass it over a screen; rubber, glass, iron, rags, &c., are separated from the fine material that is used as a fertilizer and has a commercial value, and I think it has in any city of the Union. In fact, I am a fertilizer collector myself, and these goods *have* a market value. It is well adapted for night-soil; this apparatus will work night-soil.

The PRESIDENT.—Did you ever try it with night-soil?

Mr. PRESTON.—No, not separately.

In answer to a request that Mr. Preston should make some statement about the demand for fertilizer, he said,—

It is natural to suppose that the demand for fertilizer will increase more rapidly than the country will produce it.

Question.—Why is there so much stored in the Western states that cannot be gotten rid of?

Mr. PRESTON.—I do not know that there is any great amount of *valuable* fertilizing material there that cannot be disposed of. There may be a large amount of material there that has been spoiled, and from which the ammonia has passed.

Question.—You say that you can utilize night-soil, and that the residue of night-soil would be a good fertilizer. What would you do with the residue of night-soil?

Mr. PRESTON.—I am not a chemist, but I believe it to be of value taken in connection with our other material.

Dr. F. P. VANDENBERGH, city chemist, of Buffalo.—I will occupy but a moment. I would like to congratulate Dr. Kilvington upon the able paper

he has read. Although he comes from Minnesota and I from New York, we happened to graduate from the same institution on the same evening, —so are classmates; and I am glad to have an opportunity to meet the Doctor on neutral ground to discuss this economic and scientific problem. The city of Buffalo had difficulty, Dr. Clark has intimated, in disposing of its sewage and garbage. Formerly our garbage was deposited at the lower end of Lake Erie, on the flats, and every time there was a wind-storm that dumping-ground was disturbed, and tremendous quantities of refuse were carried down the river. It polluted our own water-supply, and the villages of Tonawanda, Niagara Falls, and Suspension Bridge sought a permanent injunction against the city restraining us from dumping garbage into the river. That was felt to be a serious matter, and it is that which has prompted this careful investigation on the part of the city officials. We feared our crematory would not be a success; and we believe, if we had selected a crematory, it would not have been a success. This is not a furnace or crematory: it is a dryer, separator, and extractor. Its mechanical construction and working have been explained. The only question I wish to answer is that which the health officers of Buffalo asked me, Is the process dangerous to life, and are its products injurious to health?

The fat is extracted by benzine, which is subsequently recovered by distillation; but the temperature is not likely to become high enough to produce an explosion. It seems to be entirely safe if kerosene, gas, or other flames are not used in the building.

Most of the effluvia are burned under the boilers; and the refuse-water coming from the condenser contains about two parts total ammonia in a hundred thousand, which is very much less than is contained in the Hamburgh Canal, Buffalo, or the sewage of London.

THIRD DAY.

THURSDAY, November 22, 1888.

MORNING SESSION.

Meeting called to order by the President.

The PRESIDENT.—Announcement from the Committee of Arrangements. Is Dr. Martin here? His report is in order.

(No response.)

The PRESIDENT.—Announcements from the Executive Committee.

The SECRETARY.—Mr. President: I have here some rules and regulations established by the National Association of General Ticket Agents, relating to the transportation of dead bodies. These rules have been sent to the Association for the purpose of receiving their consideration. I therefore move that they be referred to the Executive Committee.

Motion seconded, and carried unanimously.

Dr. Rohé.—What time does the committee meet?

The President.—It will not be very long; I will try to have it arranged as soon as I get through with the routine business of the morning session. There are not now enough members present to get the thing in shape.

The Secretary.—There is a proposed amendment to the constitution, which was presented last year, and, according to the rules of the Association, is now before us for consideration. The proposed change is in Article IX, relating to the Executive Committee. It is to omit from the Executive Committee the ex-presidents of the Association. It is to strike out the last sentence of the article, which eliminates from the Executive Committee the ex-presidents of the Association.

The other proposed amendment is to Article X, relating to the Advisory Council.

President.—The Secretary will read that section of the constitution which it is proposed to amend.

The Secretary.—Executive Committee. "The Executive Committee shall consist of the President, First Vice-President, Second Vice-President, Secretary, and Treasurer; of six active members, of whom three shall be elected annually by ballot to serve two years, and who shall be ineligible to reëlection for a second successive term; and of the ex-presidents of the Association."

The Secretary.—The proposed amendment is to strike out the last clause.

Dr. Bell.—As the mover of that resolution I would say that I have kept watch of this Association from the beginning, and my object in striking out the clause that provides that all the ex-presidents of the Association shall be members of the Executive Committee, was to prevent overloading that committee to such a very extraordinary degree, calculated to dilute the action of the committee; to bring in the ex-presidents on the same footing as all other working members of the Association, not having them catalogued as occupying perpetual office, so to speak. Every one of the old members certainly is familiar with the duties of the Executive Committee, and part of them hold over, and part are elected every year. They are fresh men, and better calculated to work out the purposes and do the duties of their office than—with all due respect—the ex-presidents are, who have gone through their rôles and retired, and some of them become very lukewarm. That is the object of my offering that resolution.

Dr. Smith, of Ohio.—I am a new member, and may be considered presumptuous; but it seems to me the object was good in the first place. I suppose the ex-presidents are well acquainted with the workings of the society. I suggest the amendment might be so worded as to allow the two last ex-presidents to be a part of the Executive Committee. They would be fresh, and would not be fossilized to such a great extent.

Dr. Perkins, of New York.—I think that the experience of most societies of this kind is, that it is of great value to have the ex-presidents act

as members of the Executive Committee; and my experience has been, in those societies to which I have belonged, one after the other, that this clause has been added to their constitution. The Presidents are usually elected from a class of men who have taken a particular interest in the affairs of the society, or of the Association,—perhaps more than any of the other members; and where an executive committee is elected from the members there is not that knowledge of them that there is of the Presidents themselves. It seems to me in this way we take advantage of the experience of these men in the previous meetings of the Association.

The PRESIDENT.—Any other remarks upon the question?

Dr. SMITH.—I would suggest that the last four ex-presidents should be members of the Executive Committee.

The PRESIDENT.—Dr. Bell, will you accept that amendment—that the last four ex-presidents become members of the Executive Committee?

Dr. BELL.—I will accept that amendment.

The SECRETARY.—It seems to me the suggestion does not hold true always, that the last presidents of the Association are the most active members. We have with us constantly some of the old presidents of the Association, and they are among the most valuable workers.

Dr. SHERMAN.—It seems to me that the Association is competent to judge for itself. If you have an ex-president who has been especially active and efficient in the discharge of his duties, why not let the Association elect him each year, year after year? By so doing you do not fasten him upon the Association; he may be an incubus you do n't wish to carry. Why not let the Association judge year by year who and what they want?

Dr. BALCH, of New York.—I would like to ask whether or not it has been found in the past that the ex-president members of the Executive Committee have in any way complicated the working of the Executive Committee.

The SECRETARY.—I would say that during the space of five years we have found the ex-presidents to be among the most valuable members of the committee.

Dr. Balch moves that the subject be laid upon the table. The motion is seconded and carried.

SECRETARY.—The next amendment is in relation to the Advisory Council, Article X.

The Advisory Council shall consist of one member from each state, territory, and district, the army, navy, and marine hospital service, the Dominion of Canada and each of the Provinces, who shall be appointed by the President on the last day of each session, and who, besides acting as a nominating committee of officers for the ensuing year, to be announced at such time as the Executive Committee may appoint, shall consider such questions and make such recommendations to the Association as shall best secure the objects of the Association. They shall, at their first meeting, elect from their own number a Secretary, whose record of their proceedings shall be made part of the records of the Association.

Dr. Bell.—It simply means that a nominating committee should not nominate themselves, as a matter of good taste. They may canvass freely every other name. They shall not be under the necessity of sending some member of their own body out in order to discuss him. They shall not nominate for office any member of their own body.

On motion, the amendment was adopted.

The Secretary.—Mr. President: I have here a communication from Col. J. M. Keating, of Memphis, which I will read to the Association.

It was moved and seconded that the letter be referred to the Committee on Federal Legislation. Motion carried.

The Secretary.—I have here several applications for membership, endorsed by the Executive Committee.

It was moved and seconded that the Secretary be instructed to cast the vote of the Association for the members. Motion carried.

The Secretary.—I deposit these names, as the ballot of the Association.

President.—"The History and Administration of Quarantine in Texas, 1887 to 1888." Is Mr. Rutherford here? (Not present.)

Paper entitled "Some Personal Observations on Yellow-Fever and its Habitudes, as Opposed to the Fallacies and Dangers of Personal Quarantine," by Dr. A. N. Bell, of Brooklyn, N. Y. (See page 55.)

The President.—For the purpose of completing the organization of the Advisory Council, the Secretary will call the roll.

Roll called by the Secretary.

The President then announced the following names of members, to take the place of absent members of the Advisory Council:

Hon. Harrison Reed for Florida.
Dr. J. H. Rauch for Illinois.
Dr. A. G. Young for Maine.
Dr. John Morris for Maryland.
Dr. Wirt Johnston for Mississippi.
Dr. Geo. Homan for Missouri.
Dr. David L. Wallace for New Jersey.
Dr. John Griffin for New York.
Mr. Crosby Gray for Pennsylvania.
Col. D. P. Hadden for Tennessee.
Dr. Chas. Smart for U. S. A.
Dr. T. J. Turner for U. S. N.
Dr. Frederick Montizambert for Quebec.
Dr. P. H. Bryce for Province of Ontario.

Hon. Harrison Reed.—Mr. President, I am a resident of Jacksonville, Florida, and would like to become a member of the Association. I have been looking for some way in which I can introduce myself.

Dr. Rohé.—Dr. Morris left the city for home yesterday.

The President.—For Maryland, Dr. Rohé.

Dr. Johnston, of Mississippi, has also returned home.

The President.—The committee will meet this afternoon at 3 P. M. Are there any members who desire to appoint another time?

Dr. ROHÉ.—I would suggest 1 o'clock; quite a number of the members wish to go home at 4.

The PRESIDENT.—I have appointed the committee upon the matter I brought before you in my address, "Transportation of Dead Bodies," etc.:

Dr. Franklin Staples, of Winona.
Dr. J. H. Rauch, of Springfield, Ill.
Dr. J. T. Reeve, of Appleton, Wis.
Dr. P. H. Bryce, of Toronto, Ca.
Dr. Lewis Balch, of Albany, N. Y.

Dr. BALCH.—I wish to introduce the following resolution:

WHEREAS, By the use of patent or proprietary medicines much harm is done; and

WHEREAS, There is no legislation restraining either the manufacture or sale of such medicines;—

Resolved, That this Association request state boards of health to prepare and urge the passage of a bill in their respective states, having for its object the compelling of all owners or manufacturers of patent or proprietary medicines to file with the state board of health of the state in which such patent or proprietary medicine is made or manufactured the formula of such medicine, said formula to be kept by the board of health with which it is filed, as a matter not of public record; and that on the labels of all such patent or proprietary medicines, the formula of which has been duly filed, the words shall appear, "By permission of the board of health of the state of ———."

Dr. BALCH.—If I may be allowed to explain that resolution before sending it to the committee, I would say, sir, that an effort has been made in the state of New York to pass a bill requiring the label to bear the whole formula, but it was completely defeated before it reached the house. I would further say, as the law now stands—at least in the state of New York, I do n't know how it is in other states—we cannot, with a clear case in the court, reach these vendors or proprietors of medicines under the existing statutes on foods and drugs.

But if we could have a law so framed that the proprietor of every patent medicine must first of all file with the state board of health the formula before such medicine can be put upon the market, and that the label or labels on the bottles or boxes shall bear the words, "By permission of the board of health of the state of ———," it would be a guaranty that the contents of the bottle or box, whatever it might be, are not injurious to human life. We do not in this way guarantee that this medicine is going to be a cure-all; but it certainly would afford an assurance to the public that if taken in the manner advised on the label it would not be injurious to health or life. And further, sir, by the chemist of the state examining these preparations from time to time, we should know whether the manufacturer had held to the formula he filed with the state board of health, and if not he could be prosecuted for misdemeanor under the law. In this way the control of these preparations would be held by the boards of health of the states in which the medicine was prepared.

There is no legislation to put them down, but by such a law as is here

proposed, control can be had of all preparations hereafter manufactured, and by such control articles which would have a widespread use and most deleterious effect would be prevented from being exposed for sale, and the public thereby protected. (Referred to the Advisory Council.)

The PRESIDENT.—It is understood that the Advisory Council meet immediately after the adjournment of this session.

Dr. Rutherford being now present, reads his paper entitled "The History and Administration of Quarantine in Texas." (See page 125.)

After reading his paper, Dr. Rutherford, addressing himself to the Association, remarked that he found it necessary to perform a disagreeable task, something which by this time he ought to be somewhat accustomed to doing. He said,—

I understand that I was "raked over the coals" yesterday, after leaving this hall, by the secretary of the Louisiana State Board of Health, because of the quarantine restrictions against New Orleans this season by Texas. In regard to the places reported to me as to locality of suspected fever in that city, I think if the gentlemen would reverse the figures, he would find something more interesting.

The report was first made to me on an incoming train from New Orleans, by a business man of most respectable standing, with a request not to use his name, giving, however, the localities referred to. Matters of importance called me directly to Galveston, and shortly after arriving there a message was brought me from the president of the Shreveport Board of Health, asking of me information from New Orleans, also repeating in substance the same report that I had heard from this gentleman who was direct from New Orleans. The telegram also stated that Shreveport would immediately put on guards against New Orleans. I immediately established restrictions against that city until I could ascertain the truth, and ordered Mr. Albert Erickson, a special officer, to go and see. People were fleeing from New Orleans, and I did not intend to allow them free admittance to Texas until I knew the true state of affairs. However, upon direct message, and assurance of the secretary of the Louisiana State Board of Health that the reports were false, the quarantine was raised before the officer reached New Orleans.

I was also, I am told, charged with lack of professional courtesy. If this be true, they are themselves to blame for it. Last year when I entered upon my duties as health officer of Texas, the first time that I deemed it necessary to take precautions in that direction was on a return trip from El Paso, the 7th day of June. At San Antonio I saw by the press dispatches that two ship loads of refugees from Key West had left that place respectively for New York and New Orleans on the 4th. I sent a dispatch to the president of the Louisiana State Board of Health immediately, asking information. I will read you the correspondence between us, and you can judge for yourself *who* was discourteous.

San Antonio, June 7th, 1887.

Dr. Joseph Holt, Pres. La. State Board Health:

Absence on the Rio Grande prevented my asking the question earlier. Is it true that the "Hutchison" bro't refugees from Key West direct to New Orleans?

R. Rutherford, M.D.,
State Health Officer, Texas.

Houston, Texas, June 8th, 1887.

Dr. Joseph Holt, Pres. La. S. B. H.:

Have you received my message from San Antonio? If so, please answer.

R. Rutherford, M.D.,
S. H. O., Texas.

New Orleans, June 8, 1887.

R. Rutherford, M.D., State Health Officer, Houston, Texas:

Key West is quarantined against exactly as Havana and other infected ports. Hutchison is now in quarantine from Havana via Key West. Your two telegrams this moment received.

Joseph Holt, M.D.,
Pres. La. S. B. H.

Houston, June 8.

Dr. Joseph Holt, President La. S. B. H.:

I do not know your rules governing personal quarantine. Are persons only held five days from infected points?

R. Rutherford,
S. H. O., Texas.

New Orleans, June 9, 1887.

Dr. R. Rutherford, S. H. O., Texas:

Persons from infected ports are held no longer than five days, except when there is evidence of infection, in which case the ship and all on board are remanded for detention and treatment to the lower quarantine station, for infected vessels only.

Joseph Holt, M.D.,
Presdt. La. S. B. H.

Houston, June 9th.

Dr. Joseph Holt, Prest. La. S. B. H.:

I do not consider five days sufficient for unacclimated persons from infected ports. Please extend your time for personal quarantine to at least ten days, or Texas will have to extend it at her border. I await answer.

R. Rutherford, M.D.,
S. H. O., Texas.

New Orleans, June 9.

R. Rutherford, State Health Officer, Houston, Texas:

Neither your threat, nor its execution, can close the port of New Orleans. The time for personal quarantine, including passengers of steamship Hutchison, will not be extended one minute beyond our established detention.

Joseph Holt, M.D.,
President La. State Board Health.

Now, gentlemen, you have the sum total of my official communications with the Louisiana State Board of Health, the gentlemanly secretary of which has been pleased to accuse me of discourtesy. Now, if you kick me once, it is your fault, if you do it again, it is mine, and I assure you it is not my habit to offer this opportunity.

After this, I did send detectives to New Orleans to keep myself posted against the constantly recurring rumors of yellow-fever and mismanage-

ment at Mississippi Station. One of them the gentleman remembers very well, for, according to an interview with Dr. Holt, published in the *New Orleans Press* in September, I was for the first time apprised of how Lam ingratiated himself into their favor, which was by roundly abusing me. Yes, I did send men to New Orleans, and through the quarantine stations, and brought them back to Texas, and if I should deem it necessary for the safety of the people of Texas, I should do it again.

I thank you, gentlemen, for your attention and patience. There is much in reserve that I could say, but I do not consider this the time or the place.

The PRESIDENT.—The next paper I find here is "The Outbreak of Yellow-Fever at Jackson, Miss., in September, 1888," by Dr. Wirt Johnston. The writer is not here, and perhaps it would better be referred to the Committee on Publication. (See page 51.)

The PRESIDENT.—Paper on "The Problems of Yellow Fever Epidemics," by Dr. Jerome Cochran, Mobile, Ala.[1] (See page 41.)

Dr. Cochran prefaced his paper with the following remarks:

I am almost ashamed to present to a body like this the paper which I hold in my hand, because I feel that any paper presented to this body should be prepared with due care and consideration. This paper of mine has been almost entirely written here in Milwaukee since I came. I read it over now for the first time; not a sentence of it has been copied. Consequently if it is to go into print I would like to have the privilege of revising it and putting it in somewhat better language. I believe under the rules readers have only twenty minutes. It will take thirty or a little over to read my paper. The paper is simply a statement of propositions concerning yellow-fever. There is no argument, or history, or endeavor to prove anything. It is simply the presentations of problems calculated to promote discussion, and I hope some of them will be discussed.

During the reading of his paper Dr. Cochran said,—"One point I have omitted from my paper—the agency of refugee camps. I assure you I speak from an abundant experience when I say that they are a failure, and must always be a failure. In theory they are admirable. In practice they accomplish very little, for the very simple and sufficient reason that you cannot drive people into the tents. If you had the power of a Russian czar, by force of arms you could carry this theory out, but in no other way."

(It was unanimously agreed by the convention to extend the time of Dr. Cochran.)

Paper on "The Outbreak of Yellow Fever at Jackson, Miss., in September, 1888, by Dr. Wirt Johnston, secretary of the Mississippi State Board of Health, the writer not being present, was here read by Dr. John H. Rauch.

[1] The president remarked that Dr. Cochran was just from the "seat of war," but there was no cause for alarm as he had had him thoroughly disinfected.

Dr. RAUCH.—I wish to say that I heartily appreciate the paper read by Dr. Cochran, and the work done by Dr. Johnston. Both of these men stayed by their posts, did their duty faithfully and honestly, Dr. Cochran especially, when there were medical men against him, saying it was not yellow-fever. It tried the courage of these men to announce yellow-fever in their midst, and I think the public is under obligations to them for their courage, and the able manner in which the disease was handled in both places. These men promptly reported the disease, while in Florida it was kept hidden for months.

Paper on "Sanitation in St. Paul," by Dr. H. F. Hoyt, commissioner of health of St. Paul, read. (See page 33.)

The PRESIDENT.—Prof. Payne, director of the observatory at Northfield, Minn., has been called away this evening. He has a very short paper on "Meteorological Observations as respects Disease Prevalence." It would be a courtesy to him and a kindness to me if he should be permitted to read it now.

There is no objection, and Prof. Payne reads his paper. (See page 179.)

Dr. BAKER.—On the subject of this paper I wish to offer a resolution:

Resolved, That this Association favors coöperation in all practicable ways by its members, and by state and local boards of health, with the general signal service of the United States, and the state services of the several states, in collecting, using, and publishing all useful meteorological data.

The resolution is referred to the Executive Committee.

Hon. D. P. HADDEN, of Memphis, Tenn.—Mr. President and Gentlemen: I have no prepared paper—was not expected to have any; but I have heard the discussion of yellow-fever, the papers that have been read, and also the discussion of quarantine. I must say that the papers that have been read respectively by Drs. Rauch, Bell, and Cochran, are very apropos, and I won't attempt to discuss Dr. Cochran's paper. As I heard a gentleman say in the ante-room, the best discussion that could be made of that paper would be to re-read it. (Applause.) There are facts and statements in that paper that I conceive to be entirely true, and it would be of great benefit to the entire South if that paper could be published and put in the hands of all our health officers and our people to read. (Applause.) I say it is the clearest exposition, and states facts as plainly and succinctly, as any paper that has ever come under my observation. We have all heard a good deal of what *has* happened. The question with us in the South is, What *will* happen next summer? This organization, as I have understood—and I have attended a good many of the meetings—has been more or less committed to quarantine. Now, I do n't know whether this organization is going back on quarantine or not. Dr. Cochran says, "If you do n't want to be burned, stay away from the fire." Dr. Rutherford says, "If you don't want to be burned, keep the fire away from you." Dr. Rauch says it is by contact, by infection, that yellow-fever is spread. You all know I am not a physician—I am nothing more than a plain farmer; but I have an interest

in studying this disease, its occurrence and its recurrence ; it is to avoid this and protect the common people of our community that should interest us. The rich can move out from an infected district; they can have a train of cars in waiting, and they can come to this remote country where health prevails. What will the poor do? They are the people we must protect. We have no quarantine with us this year. It is a very easy matter to meet here and to say we ought to do so and so, and science says so and so; but let one of you get down among an excited public, and how will you go at it? Officials have to do foolish things temporarily to keep ahead of public opinion; your officials may know it is wrong, still it takes time to convince the people among whom you live. Let a case of yellow-fever occur in any city or town in the South, and there is a stampede—that is, with the rich. You can't depopulate a place entirely. Now the great question is how to keep this disease out of these places. I maintain it is by quarantine. Non-intercourse, as Dr. Cochran says—*non-intercourse* will be the way. I understand it that way, Doctor?

Dr. Cochran.—That is right.

But what does non-intercourse mean? Why, it means the destruction of all commercial travel, commercial traffic, tying up your railroads, your steamboats, and social travel and social intercourse. I do n't know but this ought to be done, but it certainly seems to me that there should be scientists enough in the United States to prevent it. There should be enough executive ability in our congress to prevent it, and there should be enough money in the United States to prevent it. While there is a prospect of this fever encroaching upon our shores, we should be prepared to meet it. The North has almost as much interest in this as the South. Who owns the Illinois Central Railroad, running from Chicago to New Orleans, with all its branches? The state of Illinois. The Kansas City Road, running still further west—who owns it? Boston. Who owns and runs the fine hotels, the resorts in Florida? Boston and Northwestern capital and New Hampshire. Now it has looked to me that with all this moneyed interest, and with all the grand development of the South, there should be a power to inaugurate a health bureau in this country that will keep out this little germ from the West Indies. In the state of Tennessee we are making considerable progress in sanitary matters. We have a good state board; we have county boards throughout the entire state I believe, except two or three counties. There is a weekly bulletin published which we all take great interest in. I am satisfied the legislature meeting in January will double the annual appropriation for health purposes. In the city of Memphis, where I have lived for a long time—and I always take a great pleasure in speaking of the city of Memphis—the question of health is the absorbing question with every man, woman, and child there. When the yellow-fever broke out in Florida, passed out and got into Decatur in some way—how it got into Jackson, Miss., I never heard—we could not but fear it would get into Memphis; we had it five years ago, and did n't want it any more.

Dr. Thornton, who is the president of our state board of health—he is known to all of you—together we deliberated, and he brought all his scientific attainments into play. We sent out inspectors on the railroads, and every man had to give a pretty good account of himself; if he did n't we did n't let him in. "We do n't want anybody to come in here at all; we would rather seal up this town three months in a year than to have one case of yellow-fever"—that is what our people say. The Cotton Exchange and the Merchants' Exchange would have a large meeting, and they would say non-intercourse is the thing. We pleaded against it. We attended those meetings. We said we knew how to handle it; if a case came in we could handle it. I always have close relations with our president of the board of health. They said, "We can furnish you all the money you need: now if you want to see a liberal community any time, you let a case of yellow-fever come around them, and they get liberal quicker than any people you ever saw: you can raise $10,000 in twenty-four hours, to spend at will. "Well, what do you want?" we ask. They say, "Stop all these railroads, do n't let anybody come." Then every railroad in the country was in arms. Wall street in New York and head-quarters in New Orleans were sending telegrams, "What are you going to do up there—are you going to stop everything?" There is where the interest of the whole United States comes in, in the quarantining of one railroad centre like Memphis. I said, "Let us treat this business just as Louisville has done. We believe we are safe, and our sanitary preparations render us as impervious to that disease as Louisville." The people said, "No." Now, you can all say you won't quarantine. You just let the people get behind you and furnish you the money and tell you what to do, and you have got to do it, or if you do n't do it they will take charge of it and do it themselves. Why, sirs, the Memphis & Charleston Railroad did n't have but one stopping-place in a distance of 300 miles, and it is for the last few days only that they have been stopping at Decatur;—and the same way with the Illinois; for one or two days they did n't have a stopping-place for many miles from New Orleans. The people got into a frenzy. Talk to them about science! Talk to you about a shot-gun! Now I imagine that was the way you talked to Rutherford. He did quarantine, as I understand it. I am not blaming him at all. I tell you there is a power always behind; it is the power of public opinion that drives people along. I telegraphed up to the governor—you people understand what non-intercourse is—I telegraphed to the governor for the use of four military companies. Trade was suspended, railroads stopped, steamboats tied up. I said, "How long, gentlemen, can we live in this way?—we can eat all the flour and bacon and everything in this town in a week ourselves. They said, "Health is the question." We just continued that non-intercourse for twenty-four hours, and they said, "Raise it." We raised it. Along about that time came a man from Decatur. He said he had been there for eight days. How he got in he never told, but he got in—he said he did. He went down to a saloon and got on a spree for three days. He

went out home to his residence in the edge of the town, and he told his wife he had just got in from Decatur, and he had taken the fever. Two of our physicians were sent to attend him, and he told the same story—he had the fever, was just from Decatur, been there eight days. It was a suspicious case. This man had been in contact, he said, with the fever; anyway he had a high fever, his eyes were yellow. By this time the neighbors found out this man had the fever. Dr. Thornton went out and examined the man; Dr. Mitchell went out—and they are experts—you all know them; they went out and examined this man very carefully, stayed with him two or three hours. He told the circumstances by which he had been surrounded, eight days as he said. He had a high fever, and they could not tell anything about it. They placed a policeman there to keep every one away. That is what you say we ought to do, doctor. We tried to do it. That night we had a meeting with the board of health, the biggest meeting we ever had in Memphis. Down in Mississippi several of you said there never was a suspicious case occurred in Memphis that we had reported. Dr. Thornton said,—"Here is a case: I do n't know but there is suspicion in this case, and we will report it." We did report it.

There is a large female school run by a young lady, with about two hundred scholars, adjoining where that suspected case was—Perry H. Binford was his name—he will be known in history as Perry H. Binford. This school closed at once; this young lady had cars and everything backed right up, and she took her whole school right out of the state. Those were young ladies brought from all over the country, and she knew their parents would be anxious about them. We discussed what we should do with Binford that night. We wanted to send him to the pest-house, and the county officer refused positively to allow us. The neighbors said, "You must take this man right away." Finally we did take him to the hospital.

Voice.—Have n't you got a crematory?

No, sir. There was the highest state of excitement I ever saw in that city. But we reported that case, and now we are looking forward to next summer. This school was sent on to St. Louis on the cars. The next morning we woke up and Perry was gone, and it dawned upon us all that he had been on a big drunk. There is a case where three or four as fine physicians as ever practised medicine were deceived. They had to judge by the location of the man during the previous week or two. And then it was that the whole thing looked so ridiculous, and we telegraphed this school to come back and open. The commercial bodies came together and said, "It is about time to get through with this thing, raise this quarantine," and I called in the soldiers, and we have been going on ever since.

What Memphis is going to look after now, just like Texas, as the time approaches, are the communities, families, and all. We shall look out for No. 1; and it will have to be that way until the people can combat this disease like any other.

Pardon me for occupying one moment longer. I want to allude to Memphis again. We have at last found an abundant supply of the purest water in the United States—so says Dr. Smart. We have, since you met there, discovered artesian wells which we bore 450 feet deep. We have now 32 flowing wells. Dr. Smart examined this water two or three times, and he says it is so pure he could scarcely tell it from the distilled water with which he made the test. Since we have been using that water we find a decrease in our mortuary reports. So when you meet there again we will serve you with water as pure as the Bethesda you drink here.

Motion to adjourn.

Dr. THOMPSON, of Kentucky.—I agree perfectly with what Col. Hadden has said in regard to a discussion of Dr. Cochran's paper: the only way I should discuss it would be to re-read it. I wish to make the same motion Dr. McCormack made in regard to the paper read by Dr. Smart, that the Secretary be requested to put it in type at the first practicable moment, and furnish it to the different state boards of health.

The PRESIDENT.—It is moved and seconded that Dr. Cochran's paper be placed in type at once for distribution. If it be your pleasure that it be done, signify it by saying "Aye."

It is so voted.

The PRESIDENT.—Is the motion to adjourn persisted in?

Dr. COCHRAN.—I make the motion that we adjourn until 4 o'clock.

The PRESIDENT.—That conflicts with a committee meeting.

Dr. BALCH.—I move that Dr. Bell read the report of the Committee "On Sanitary and Medical Service on Emigrant Ships."

The PRESIDENT.—If Dr. Bell will pardon me a moment. The Advisory Committee meets in this room at 1 o'clock, after the adjournment of this meeting.

Dr. ROHÉ.—If the meeting is too long, the Advisory Council will not remain, because they propose to get their lunch at the usual time; and there ought to be some provision made for the meeting of the Advisory Council at a regular time.

Report of the Committee "On Sanitary and Medical Service on Emigrant Ships" read by Dr. A. N. Bell, of New York city. (See report elsewhere.)

Dr. THOMAS J. TURNER, U. S. N., Washington, D. C.—The remarks of Dr. Bell, and his proposed bill, interest me very much. I had the honor to present before the Association a paper upon the "Hygiene of Emigrant Ships," in which these matters were considered, and they have been published in one of our volumes. The "Passenger Act of 1882" was an advancement upon previous legislation upon emigration, and the *Congressional Record* will give the debate upon that subject in the House of Representatives. And, by the way,—as we are here in Milwaukee,—it is but proper to mention that to two of Wisconsin's representatives at that time, Mr. Guenther and Mr. Deuster, the passage of this Act is due. Dr. Bell will recall the fourth national quarantine con-

vention, and the "400 cubic feet of air-space" there so well advocated as an essential element in maritime sanitation. Increase of air-space, and consequently of superficial area, are both means of arresting the influx of emigrants; but it does not strike me as a feasible method. It is only an aid, and I say this from abundant observation. Already I have seen suggestions as to the ratio per ton of the vessel to immigrant-carrying capacity as another means of restricting immigration, and there is practicality in such method for restriction.

The real matter at issue is not the *quantity* of immigrants; it is the *quality* of the immigrant, and that part of the problem belongs to the sociologist. I did not catch the exact tenor of the remarks upon "Saloon Passengers" and "exclusive use," as being used as a subterfuge; but I have abundant memoranda upon that matter concerning the legal interpretation of those terms. I recall the case of "U. S. *v.* Nicholson," decided in the U. S. Circuit Court, in Oregon, about the middle of the year 1882, and the "Head Money Cases," decided in 1883 in the U. S. District Court of New York.

You can readily understand that the interest in this matter arises from ships and passengers being the carriers of many of the known as well as the unknown causes of disease movement. To restrict immigration, now a political nuisance, from a sanitary stand-point, involves more hard work than at first appears. There is a sentiment in it, powerful for good, but arrayed against it is the cold, calm logic of the "Almighty Dollar." To attack the nuisance from a sanitary stand-point is only an aid to the political economist, and it will require more than sentiment in this matter to affect legislation, even when approached by such lines. At any rate, let us go upon record as proffering a helping hand.

Dr. Balch.—I move the following resolution:

Resolved, That the report of this committee upon such sanitary and medical services on board emigrant passenger vessels as may be subject to congress, be adopted as the sense of this Association, and that the Secretary be instructed to send copies of it to the Secretary of the Treasury and to the Committees on Commerce and Navigation in the Senate and House of Representatives, respectively.

The motion is seconded by Dr. Turner.

Referred to the Executive Committee.

Dr. Perkins.—I beg leave to ask a reconsideration of the resolution offered this morning—a proposed amendment to the By-Laws, by which members of the Association who are members of the Advisory Council are not allowed to be nominated for officers of the Association.

Motion seconded.

The President.—It is moved that the vote whereby this Association decided to amend its Constitution, to the effect that no member of the Advisory Council should be nominated to office, should be reconsidered.

President.—It will not have to go to the committee. It can be considered now.

Dr. Bell.—I think the adoption of the resolution this morning was entirely right, and the Association should stand by its acts. I know of

nothing more shameful than for a nominating committee to nominate its own members for office. I have seen the most shameful trading and swapping of votes. Such things were swallowed down by the Association because they did not know it. Common decency ought to prevent such a thing, and if it do n't, I think a law of the Association ought to prevent it.

Dr. ROHÉ.—I would simply like to say that the Advisory Council of this Association is composed of members who are supposed to have some knowledge of the working of the Association, and records of the members of the Association. It frequently happens that the members of the Advisory Council are the only representatives of the states represented in the Association. It happens to-day that Dr. Rutherford—I believe I am right—is the only representative of the state of Texas at this meeting. It might be desirable to nominate Dr. Rutherford for an office; and yet, by such a law we would be prevented from nominating him—even if he were the most worthy and deserving member of the Association—to an office. The Advisory Council, which is supposed to have the interest of the Association at heart as much as any member of the Association, should not be crippled by such limitation of powers.

Dr. BELL.—It strikes me so forcibly, with my knowledge of the course of this Association—I have been more or less identified with the working of this Association from the commencement—I would say, as a matter of common decency, as well as of right and honor, that this Council of the Association should not nominate from among themselves officers of the Association. There are men here—how many have we on the rolls of this Association? I cannot call the number; certainly a very large number—from which officers could be chosen; and I would not like to see members of the Advisory Council in any respect limited by preferences. They can nominate somebody at home who is a member of the Association. In the case cited, he can suggest to the Council some worthy man at home who can represent his interest, and the health interests of Texas, as well as himself.

Dr. ROHÉ.—I will ask Dr. Bell this question, whether any member of the Association who is not on any committee is more interested in the welfare of this Association than members of the committee.

Dr. BELL.—I answer, He is at least equally so. (Calls of "Question!") I have not been more interested in this Association when I have been on than when I have been off a committee. I should think every member identified with the promotion of the public health holds to that position: he does not require he shall be given an office in this Association in order to give him an interest in its purposes.

Dr. CONN, of Concord, N. H.—I have no objection to entertaining the motion which prevailed this morning. In fact, I support it. But I wish to give notice, if that is to prevail, that I shall make a motion that the Advisory Council be abolished. It is of no account whatever. Let us have our elections in open session.

It is moved and seconded that the proposed amendment be laid upon the table.

Motion carried.

Motion to adjourn until 8 o'clock this evening, made by Dr. Balch, seconded and carried.

EVENING SESSION—8 O'CLOCK.

Dr. Samuel S. Kilvington, of Minneapolis, Minn., submits the following resolution:

WHEREAS, There is a manifest lack of uniformity in the classification of death-causes, as exhibited by our mortuary statistics and in the nomenclature of diseases recognized in such causation; and

WHEREAS, Many of our tables are not in accord with the progress which has been made by medical science in a knowledge of pathological conditions and death-causes; and

WHEREAS, Many points of superiority are to be discovered in the death-tables of other countries;—therefore, be it

Resolved, That a committee of three members of this Association be appointed upon "The Classification and Nomenclature of Death-Causes," which shall report to this Association at its next annual meeting a uniform plan of classification and a recognized system of nomenclature, with such recommendations as it may see fit to make.

The PRESIDENT.—The resolution will go to the Advisory Council.

D. E. Salmon, D. V. M., chief of the Bureau of Animal Industry, Washington, D. C., reads a paper on "Tuberculosis: Its Origin, Detection, and Control." (See page 92.)

Dr. SALMON.—Before reading this paper I would like to explain that its title is a little more comprehensive than I would like to have had it. It was given, I believe, by our President, who can lay out more work than an ordinary man can do in the time allotted. In the paper, therefore, which I shall read, I shall confine my remarks—which will be brief—to questions connected with the origin and prevention of tuberculosis, and leave the question of detection out of consideration.

"Some Observations on the Origin and Sources of Disease Germs," by Theobald Smith, M. D. (See page 171.)

The President next introduced Mr. Duane Doty, of Pullman, Ill., formerly superintendent of public instruction for Chicago, who would favor the audience with a short and lively address descriptive of Pullman, Ill. The President remarked that constant inquiry had led him to believe that the Association ought to have before it a definite statement of what has been done at Pullman; that he had obtained a witness who would put himself upon the stand and submit himself to any questions in regard to that city the audience desired to ask; that Mr. Pullman had permitted Mr. Doty to come here for that purpose; that he had had to do with the growth of Pullman, the most remarkable city on the continent, from its incipiency to its present condition. (See page 191.)

President Hewitt then asked the following question:

Question.—Mr. Doty, how do you dispose of the sewage at the farm in winter?

Mr. DOTY.—It runs upon fields called filter-beds, and the outflow from the drains in them is continuous. So far we have had no difficulty win-

ters in filtering the sewage. The sewage in winter runs upon those tracts, and it is continuously passed out into the open ditches in the winter exactly the same as in the summer. When one bed is full, we turn it upon another, and then another. In our climate the mercury reaches 20° below zero on rare occasions. We never have had the least trouble in the winter in having the sewage take its course in the open ditches to the lake. How it might be as far north as St. Paul I would not pretend to say. I am only speaking of it for Pullman.

Dr. Bell then asked the following questions:

Question.—Permit me to ask you if you have the usual prevalence of infantile disorders, such as measles, whooping-cough, scarlet-fever, etc.

Mr. Doty.—The company's surgeon, who resides at Pullman, says Pullman differs from any other place he has been in in this: I will use his language. His observation has always been that where diphtheria, measles, scarlet-fever, etc., get into a town, it generally cleans up the town; but our cases are always isolated, and never become epidemic as in most other cities. Cases are brought here by visitors, or by those who have returned here from a stay where such diseases prevailed. Two cases of small-pox we have been able to trace directly to the cars. One woman sat all the way from Chicago in the seat in the cars with a person with small-pox: of course she had it. Those cases are never epidemic. Our physicians are the authority that for the population we have only from one third to one half as many cases needing the attention of a physician as ordinarily occur in so large a population.

Question.—How about the milk-supply at Pullman?

Mr. Doty.—It is obtained in part from the Pullman dairy farm, where 100 cows are kept, and in part from general dealers in milk. The town is entirely open for dealers, and I suppose it is like milk obtained anywhere; if it is adulterated at all, it is adulterated with Lake Michigan.

Then followed a running fire of questions by members of the convention, which were answered by the speaker.

Question.—How many resident physicians are there in Pullman?

Mr. Doty.—There are now four, and our population is 11,000. In this country there is an average of one physician for every 500 persons. What the effect might be of a still greater reduction of the number of doctors in Pullman I am unprepared to state. (Laughter.)

Question.—In case of the illness of a tenant operative, and he is unable to pay his rent, is he allowed to remain in his house?

Mr. Doty.—They are allowed to remain if they are known. Of course that cannot last forever. We have been allowing a dollar a day to operatives who may have been injured. The largest generosity has always been exercised in such cases, and no tenant under such circumstances has ever been put to inconvenience.

Question.—Does the company have anything to do with the mercantile and other business of the town?

Mr. Doty.—No. The company is merely a landlord, and rents

stores to business men, and these business men have to sell in competition with Chicago and the smaller surrounding towns.

One other sanitary feature: If you have a society, the Woman's Christian Temperance Union, here, they will be pleased to hear it. Mr. Pullman has always forbidden the sale of intoxicating drinks in the town.

Question.—Have you any typhoid fever in Pullman?

Answer.—There have been a few cases of a fever this autumn which has been prevalent throughout the country. I have a member of my own family, whom I left with a great deal of reluctance, I fear has the typhoid fever. It has been diagnosed as "typho-malarial" trouble. I do n't know what that means; I do n't know whether they do or not. There is but little of this fever in Pullman, though much of it in the surrounding towns.

Col. Waring.—Last year, or year before, an officer of the city of Worcester was sent to examine the farm at Pullman. He reported on his return that the farm was carried on solely for the purpose of money-making; that the sewage was used only so far as to accomplish that result; that when not so needed it was simply run through open ditches into Lake Calumet.

Mr. Doty.—He was certainly misinformed. I was with the gentleman, and went over the farm with him. We have had but few cases, where, from the breakage of a pipe, sewage has been allowed to run into the lake. The gentleman from Massachusetts came there with prejudices; he came with a committee of eleven of the Massachusetts legislature, as the state authorities had determined to compel the city of Worcester to do something it ought to do. He was determined to see nothing whatever in our work in Pullman that could be of the least advantage to the city of Worcester. The other ten saw it plainly.

Question.—What are the hours established for a day's work?

Mr. Doty.—Ten hours. Sixty hours of work for a week are completed by 1 o'clock Saturdays, which enables workmen to have Saturday afternoon as a half holiday. By 2 o'clock Saturday afternoon a visitor would wonder where the work people were, though the streets would be full of men. The fact is, the workmen are now attired in a manner that causes them to be recognized as the best dressed community in the world. We have 3,000 bachelors in Pullman. These young men earn $600 to $800 a year each, and have no use for it all except in the best of clothing.

Question.—Has any provision been made for teaching boys trades in the shops—training them?

Mr. Doty.—There are some boys at work in all the departments, and quite a large class are at work learning carving. I think we have taken in all the boys in the shops whose parents care to have them there. It is the intention to provide fully for such boys, and at no distant date to give them advantages of instruction in a well appointed training and technical school. Mr. Pullman's idea is this: These young men will be

sent to school, where they will be taught all the recent sciences by the best theorists, and in their homes, with their fathers, getting the hard common-sense of those practical men, that the one will react on the other and tend to elevate the entire mass of our laboring population.

Question.—Will the gentleman explain in what manner the garbage of the town is disposed of?

Answer.—The garbage question is the only question that has been an annoyance to us; we have not yet decided upon a definite plan of disposing of it. It is now taken a mile south of the city and buried. The day is not far remote, in all probability, when garbage and other waste will undergo treatment in some form of a rendering establishment such as that recently put in operation in Buffalo.

Question.—We would like to know to what extent houses are quarantined there in cases of contagious diseases.

Mr. Doty.—A sign is at once placed upon the door of a house where there is a case of contagious disease, and the premises carefully disinfected. No contagious disease has yet become epidemic in Pullman.

Question.—I think you were interrupted a few minutes ago when speaking of the question of temperance in Pullman. How do the men seem to like that restriction?

Mr. Doty.—So well that I believe if the matter could be put to a vote nineteen out of twenty of them would oppose any change in this restriction. Of course men who have formed the habit of drinking—it has always been a query in my mind whether they were worth saving or not—can get liquor in Chicago and in some of our suburbs. But the absence of this debasing influence is most salutary, for men are not inclined to leave pleasant surroundings simply to visit a groggery in a neighboring village.

Question.—At what has the sickness rate been determined?

Mr. Doty.—The physicians of Pullman tell me that the number of cases to which a physician is called in Pullman—three of them tell me—they are called about one third as many times as they would be in any other place having a like population; and our own surgeon tells me he is called about half as frequently. They all say there is less sickness in Pullman than in any other place on earth. Of course we have a picked population—not many old people. Some have brought their grandfathers and grandmothers there: I notice in the death rates I occasionally get one over eighty. As a rule, the people are in their vigor, and they have not any time to be sick.

Question.—Have you ever had the drinking-water tested—ever had any bacteriological analysis made?

Mr. Doty.—No. The water is from Lake Michigan, and is excellent. It has not been submitted to bacteriological tests there; a chemical analysis shows it to be free from lead and other metallic impurities from pipes through which it passes.

As a social, artistic, scientific, and business experiment, the new city is receiving increasing attention, for it is a long step in advance of any-

thing which has preceded it, in making better homes for workmen—in fact, for an entire people. It is no doubt destined to aid largely in the solution of problems growing out of the relations of labor and capital, as well as the sanitary ones in which this convention of distinguished men is so profoundly interested. Permit me to close by saying that President Pullman will be glad to have members of this Association visit the city whenever opportunity offers.

A vote of thanks was tendered to Mr. Doty for his interesting address.

The PRESIDENT.—It has been thought best by members of the Executive Committee that a letter addressed to the Association by Dr. Joseph Holt, of New Orleans, should be read to-night.

The letter from Dr. Joseph Holt was thereupon read by the secretary. (See page 183.)

Dr. LINDSLEY.—It may be proper to state, for the information of those few here who do not know the fact, that a year ago one of the philanthropic and liberal members of this Association offered two prizes, one of $500 and another of $200, for essays on cooking. The committee would make, then, the following report. (See page 264.)

The SECRETARY.—I have here a sealed envelope which contains the name of the successful competitor.

It bears this motto, "Five Food Products Illustrated by Practical Recipes."

On opening the sealed envelope it was found that the prize had been awarded to Mrs. Mary Hinman Abel.

The PRESIDENT.—There is no further business before the meeting. We will adjourn until 9 o'clock to-morrow morning.

FOURTH DAY.

FRIDAY, November 23, 1888.

MORNING SESSION—9 O'CLOCK.

President HEWITT.—The Association will please come to order. The members of the Advisory Council are at this moment having a meeting on account of some little irregularity. Announcements from the Committee of Arrangements. (None.) Announcements from the Executive Committee:

The SECRETARY.—The following resolution was read yesterday:

Resolved, That this Association favors coöperation in all practicable ways by its members, and by state and local boards of health, with the general signal service of the United States, and the state service of the several states, in collecting, using, and publishing all useful meteorological data.

The Executive Committee recommend the adoption of this resolution.

On motion, the resolution was adopted.

The SECRETARY.—The Executive Committee recommend to the Association the adoption of the resolution offered yesterday by Dr. Balch.

On motion, the resolution was adopted.

The following paper was referred to the Committee on National Legislature by vote of the Association: "Organization of a National Health Service," by S. W. Latta, of Trenton, N. J., Chief Medical Examiner of the Pennsylvania R. R.

The President.—Reports of the Committees.

Dr. Walcott.—I have a report from the committee appointed at the Memphis meeting of the board, upon the establishment of bureaus of health. The Committee "On Resolutions in relation to Commissioner of Health" beg leave to submit the following report:

Unless it is specifically called for it is a matter of record, and I will not read the report of the committee. It presents, however, the arguments which this Association has from time to time urged, and which the committee themselves are inclined to urge.

Dr. Balch moved that the report be accepted and adopted. (See page 251.)

Dr. Reeve of Wisconsin read the report of the Committee on the Transportation of Dead Bodies. (See page 262.)

On motion, the committee is discharged.

The Secretary.—I have here the report of the Committee on State Boards of Health. I move it be read by title and referred to the Committee of Publication. (See page 255.)

Motion carried.

The Secretary.—I have here several applications which have been passed upon by the Executive Committee, vouched for by two members.

Dr. Perkins.—I move they be accepted.

Motion carried.

The President.—Announcements of the Advisory Council:

Dr. H. C. Dunnavant, of Osceola, Ark.—The Advisory Council beg leave to report that they met as per appointment, and the following proceedings were had. (See page 265.)

This morning we found we had made a mistake and elected Col. Hadden, who was ineligible; the Advisory Council met and corrected the error. Dr. Walter Wyman was elected as member of the Advisory Council for the ensuing year.

Dr. Perkins.—I move that the report be accepted, and that the secretary be instructed to cast the vote of the Association for the nominations made. Motion carried. (See Officers and Committees.)

Brooklyn was selected as the next place of meeting.

President Hewitt.—In making the nominations I have saved my successor, so far as I know, the serious embarrassment that was left to me. I have consulted him in the appointment of the committees. The appointments are not yet completed.

President Hewitt then announced the standing and special committees. (See Officers and Committees.)

The President.—On resolutions in Relation to Commissioner of Health—as the work of that committee has not yet been completed, it

is thought desirable that that committee should be left intact. So that shall remain as it is.

Sanitary and Medical Service on Emigrant Ships. We had some difficulty in completing the list; it is a question that should have been thoroughly gone into heretofore, but it has not been taken hold of by the man that ought to do it. I have selected men I think you will recognize.

Dr. WALTER WYMAN.—I would like to request that my name be withdrawn from the list of the Advisory Council, as I am a member of the Executive Committee.

The PRESIDENT.—I nominate Dr. Richard Gundy. Motion carried.

Upon motion of Dr. Perkins, of Schenectady, N. Y., a resolution of thanks was passed in recognition of the courteous attentions and hospitality extended to the Association by the Woman's Club of Milwaukee. This resolution, at the suggestion of the President of the Association, was ordered suitably engrossed for presentation.

WHEREAS, This Association feel that the success of this meeting is greatly due to the kindness of the Woman's Club of Milwaukee,—

Resolved, That this Association, through its officers, beg leave to tender to the ladies of the Woman's Club their hearty thanks for their attention, kindness, and hospitality.

On motion of W. J. Smith, a vote of thanks was tendered the several railroad companies who have given the Association reduced rates.

The PRESIDENT.—In retiring from the office I have held for a year, I take the greatest pleasure in presenting to you the gentleman who is to succeed me. If age, experience, fidelity to and love of his profession entitle any man to such recognition as you have given him, he is the deserving one. (Applause.)

Dr. HOSMER A. JOHNSON, of Chicago, Ill.—It is not necessary, gentlemen, that I should say anything. The honor that you have conferred upon me is one that came to me quite unsought. I can only promise you that I will do what I can to promote the interests of the cause for which this organization was created, and has been kept in existence through all these years. If the past is in any sense prophetic, I think we may reasonably trust that this Association will continue to be an important factor in the education of the public, as well as of the profession, in that department of science which concerns itself with the prevention of disease, and which will be in all history, it seems to me, the crowning glory of this middle portion of the nineteenth century.

I thank you for the honor you have conferred upon me, and beg your cordial support, as I am confident I shall have it, in my efforts to discharge the duties of my position. (Applause.)

Permit me in this public way to make an acknowledgment. I do not know what the presidents have done heretofore, but in the formation of the committees for the ensuing year, my predecessor has done me the honor to consult me; and it seems to me it is one of those courtesies which ought to be extended, and I hope and trust it is a precedent which will hereafter be observed in all similar cases.

The SECRETARY.—I desire to announce to the members of the Execu-

tive Committee that there will be a meeting of that committee immediately following the adjournment of this meeting, in the office below. It is important that all members should be present.

Motion to adjourn, by Dr. Kilvington. Motion seconded.

Hon. HARRISON M. REED, of Florida.—I want the privilege, as a citizen of Florida, of correcting one false impression that will arise from the utterances that were made in connection with the discussion of yellow-fever. I was not enrolled as a member of this Association at the time, and did not then feel that I was at liberty to express an opinion.

The PRESIDENT.—This is a proposition to continue the discussion of yellow-fever, is it not?

Mr. REED.—Simply a personal explanation, due to the state I have the honor to represent.

Motion made and seconded that Mr. Reed be allowed the privilege of making the explanation.

Mr. REED.—The line marked out in the address of the President for the regulation and suppression of yellow-fever in the South was the most practical one that I have heard proposed. In the state of Florida we were left without a state board of health by the neglect of the legislature. We were entirely helpless to protect ourselves under the law. The fever first appeared at Jacksonville, and the first case that occurred there was reported by the president of our board of health, notwithstanding it has been reported here that we had concealed the existence of fever, and had thus allowed it to be propagated.

The point I wish to make is, that the thanks of this Association are due to the president of the Board of Health of Jacksonville, more than to any other individual in the South, for the manner in which he stood up against the popular sentiment and announced the first appearance of yellow-fever, and removed the patient to the hospital, where he was cared for and restored to health. There were concealments in various neighborhoods, but not with the collusion of the profession or representatives of the profession there, but for local purposes, and to prevent a stampede.

There is no other way that we can secure ourselves against these panics and this shot-gun policy, except in the line marked out in the address of the President—that we secure the confidence and coöperation of the people.

You let this announcement go out uncontradicted, and let the impression prevail that we have in all portions of Florida concealed there the germs of yellow-fever, to be propagated whenever there is a climatic condition favorable, and you will destroy the interests of the state. I want the impression to go out differently from what would be inferred from the remarks of the gentleman from Mississippi.

The Board of Health of Jacksonville has not a superior anywhere; and the head of that board is entitled to more than he will ever receive for the manner in which he stood up against the clamors of the press and wishes of the people for concealment, and advertised the prevalence of yellow-fever, and reported every individual case; and I have not a

question but that hundreds of cases have been reported that were not yellow-fever.

I thank the Association for allowing me to enter my protest against such an impression. When the people are inspired with confidence that the profession know how to handle this disease, there will be an end to panics. The shot-gun policy, which was inaugurated because of confusion in council and want of coöperation, has killed more people than the yellow-fever.

Dr. ROHÉ.—I have a resolution I should like to offer.

Resolved, That the thanks of the American Public Health Association be tendered to Dr. Robert Martin, Commissioner of Health of the City of Milwaukee, and to other members of the Local Committee of Arrangements, for the provision they have made for this meeting; and to the local press for the excellent reports which have been made of the proceedings of this Association.

Seconded by Dr. Kilvington, and adopted.

Motion to adjourn renewed, seconded, and carried.

Adjourned *sine die*.

REPORTS OF COMMITTEES.

PRESENTED AT THE SIXTEENTH ANNUAL MEETING OF THE AMERICAN PUBLIC HEALTH ASS'N, MILWAUKEE, WIS., NOV. 20–23, 1888.

REPORT OF COMMITTEE ON RESOLUTIONS IN RELATION TO COMMISSIONER OF HEALTH.

The Committee on Resolutions in Relation to Commissioner of Health beg leave to submit the following report of progress:

At the Memphis meeting of the Association your committee were appointed for the purpose of securing the legislation indicated in the following preamble and resolution:

WHEREAS, In the judgment of this Association some form of national health administration is essential to the protection of the nation, and to a proper use of the various facts and statistics that can be collected from the states and territories,—

Resolved, That the Advisory Council heartily endorse the recommendations of the president of the Association relating to the creating of the office of health commissioner by the general government, and, further, that we earnestly recommend that the Association use every and all honorable means toward bringing about the necessary legislation to create such an office.

Resolved, That a committee of five be appointed by the president for the purpose of recommending such legislation, the members of the committee to be named by the president.

A meeting of the committee was held in Washington in the month of January. It was then ascertained that a bill was then actually under consideration by the Committee on Commerce of the House of Representatives which embodied all the essential features of the legislation to which reference is made in the above preamble and resolution.

The committee therefore appeared before the Committee on Commerce and urged the favorable report of the bill under consideration.

The committee listened with apparent interest to the statements made by your representatives, and on the 15th of February, 1888, reported back to the house of representatives the bill which is here given, with a statement of the result of their deliberations, extracts from which are here given.

A Bill to prevent the introduction of contagious and infectious diseases into the United States, and to establish a Bureau of Public Health. (H. R. Bill 1526, 50th Congress, 1st Session.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there shall be established in the Department of the Interior a Bureau of Public Health. There shall be appointed from civil life by the president, by and with the advice and consent of the senate, a commissioner of health, who shall be intrusted with the management of the bureau herein established. He shall be paid an annual salary of four thousand five hundred dollars. For his use the secretary of the interior shall provide suitable offices, and, with the approval of the same, he shall employ such assistants and clerks as may be necessary.

SECTION 2. That it shall be the duty of the Department of State to obtain from the consular officers at foreign ports and places all available information in regard to the sanitary condition of such ports and places, and to transmit the same to the Bureau of Health; and said bureau shall also obtain, through all sources accessible, including state and municipal sanitary authorities throughout the United States, weekly reports of the sanitary condition of ports and places within the United States; and shall prepare, publish, and transmit to the medical officers of the Marine Hospital Service, to collectors of customs, and to state and municipal health officers and authorities weekly abstracts of the consular sanitary reports and other pertinent information received by said bureau; and shall also, as far as it may be able, by means of the voluntary coöperation of state and municipal authorities, of public associations and private persons, procure information relating to climatic and other conditions affecting the public health; and shall make an annual report of its operation to congress, with such recommendations as it may deem important to the public interests; and said report, if ordered to be printed by congress, shall be done under the direction of the bureau. That the necessary printing of the Bureau of Public Health shall be done at the government printing-office upon the requisition of the commissioner of health, in the same manner and subject to the same provisions as other public printing for the several departments of the government.

SEC. 3. That the commissioner of health shall, under the direction of the secretary of the interior, frame rules which, when approved by the president and issued by the Department of State, shall serve for the instruction of consular officers of the United States and of the medical officers serving at any foreign port. In compliance with these rules, every master of a vessel destined for a port of the United States shall be furnished with a certificate containing a detailed statement of the inspection of the vessel, cargo, crew, and passengers, and of the sanitary measures carried out at the expense of the vessel; or if such measures are not carried out, instant warning shall be transmitted to the bureau, who shall immediately notify the quarantine authorities of the port of destination.

SEC. 4. That the Bureau of Public Health shall, with the approval of the secretary of the interior, make investigations, both in the United States and, if necessary, in foreign countries, into the nature, origin, and prevention of contagious and epidemic diseases, as well as the causes and conditions of particular outbreaks of disease in the United States, and shall publish and distribute documents relating to the prevention of disease.

SEC. 5. That the president is authorized, when requested by the Bureau of Public Health, and when the same can be done without prejudice to the public service, to detail officers from the several departments of the government for temporary duty, to act under the direction of said bureau, to carry out the provisions of this act; and such officers shall receive no additional compensation except for actual and necessary expenses incurred in the performance of such duties. When a detail of suitable officers cannot be made, the commissioner of health may employ such experts, and for such time and in such manner as the funds at the disposal of the bureau may warrant, subject to the approval of the secretary of the interior.

SEC. 6. That to defray the expenses incurred in carrying out the provisions of this act the sum of seventy-five thousand dollars, or so much thereof as may be necessary, is hereby appropriated, to be disbursed under the direction of the secretary of the interior, on the requisition of the commissioner of health.

SEC. 7. That an act entitled "An act to prevent the introduction of contagious and infectious diseases into the United States, and to establish a National Board of Health," approved March third, eighteen hundred and seventy-nine, and all other acts and parts of acts conflicting with the provisions of this act, are hereby repealed.

SEC. 8. This act shall take effect sixty days after its passage, within which time the commissioner of health shall be appointed.

Report of the Committee on Commerce, to whom was referred the bill (H. R. 1526) *to prevent the introduction of contagious and infectious diseases into the United States, and to establish a bureau of public health, have had same under consideration, and beg leave to report as follows:*

The importance of an organized public health service in connection with the general government is generally conceded. Every civilized country has made such provision for the health and safety of its inhabitants. The necessities of modern life require such sanitary supervision.

The increase in population within recent times and its concentration in large communities, the rapid growth of commerce, and the largely increased communication between different countries and various portions of the same country, owing to the improved facilities for intercourse, have tended to diffuse more rapidly and generally the several forms of contagious, infectious, and epidemic diseases, and increase their danger and fatality.

It becomes important, therefore, that the facts relating to the nature of these diseases, and especially the laws of their dissemination, should be ascertained in order that proper and efficient measures of prevention may be adopted. Such diseases are not localized or limited by state lines. They spread rapidly and widely and become a national scourge, calling for national measures of relief.

* * * * * * * *

Yellow-fever is another pest whose ravages are not confined to any locality or state, but which, imported from its home in the tropics, has spread over large portions of our country, producing most disastrous results. Measures to check the progress or prevent the invasion of this class of diseases must be national in their character, authority, and the extent of their application.

In 1869 one of the states of the Union recognized the necessity of a public sanitary service, and established a state board of health. Since then similar boards have been organized in more than thirty states, and during this period they have in every instance commanded the confidence of their respective governments and the people. Through their annual and special reports they have spread before the public a mass of valuable information respecting the laws of health and the conditions which produce or aggravate disease in communities, and the methods of preventing the same; the importance of preserving the sources of water-supply for towns and cities from pollution; the necessity to the public health of good and ample drainage and freedom from sewerage gases. They have warned the people respecting the various adulterations of food, and have secured legislation for the prevention of such frauds. They have investigated and reported upon the effect of occupations and of long hours of employment upon the health of the laborer. And they have procured salutary legislation for the protection of the health and lives of the people.

It would seem that when so much has been accomplished by state health organization, a national health service covering a wider field and controlling conditions which they either separately or conjointly cannot reach, must, if properly organized and prudently and efficiently administered, be beneficial to the public interests. Congress, in 1879, recognized the propriety of creating such a service, and established the National Board of Health, which still exists. It performed good service for several years, but the fact cannot be disguised that it does not now command the confidence of congress or the country, and is no longer useful.

* * * * * * * *

This bureau could utilize for the public service the vast amount of facts already in possession of the general government, or that can easily be obtained by it, viz., the information in the possession of the state department obtained from consular officers

abroad, the statistics of mortality and disease that can be furnished by a very large number of cities and towns throughout the land, only now available by an investigation of many hundred separate documents which cannot at present be found collected in any one place, and yet of consequence as showing the prevalence of diseases in some one part of the country which we know by experience will appear in certain other portions, and of which we should have timely warning to enable us to prepare measures of prevention if possible.

In the four last census reports of the United States an attempt has been made to furnish statistics of mortality and disease. The director of the vital statistics of the tenth census remarks:

The fact that it is impossible in any large community to collect complete and reliable data with regard to births and deaths by means of an inquiry made only at the end of the year for which the data are desired, is well known to all who are familiar with the subject of vital statistics, and the experience of the United States census furnished no exception to this rule. But as the United States has no system of registration of vital statistics, such as is relied upon by all other civilized nations, for the purpose of ascertaining the actual movement of population, our census affords the only opportunity of obtaining even an approximate estimate of the births and death rates of much the larger part of the country; and the data which the census gives, imperfect as they are, are the only ones by which we can compare the healthfulness of this with that of other countries, or can ascertain even approximately the relative salubrity, or liability to particular forms of disease, of different parts of our own territory.

This bureau could do much to supply the deficiencies above noted. At present every new census is obliged to recreate forms for vital statistics, and each census has had a method of its own. The bureau could do much of this preliminary labor, and its experience would be of the greatest value to the superintendent in charge of the work. It would be of even greater value in stimulating the various portions of the country to a more active interest in their respective vital statistics than the census authorities, because this bureau is permanent and its action continuous. The rules for which provision is made in the third section would, as a measure of only common prudence, be framed after consultation with the various state boards of health and quarantine officers of the principal ports. Requirements for the satisfactory condition of ship, crew, cargo, and passengers would, if agreed to by the officers of the leading ports of the country, go far towards producing uniformity in these respects where now the greatest diversity exists, to the detriment of commerce and the public health; and, finally, it being the province of the bureau not only to investigate the nature and origin of contagious and infectious diseases, but to adopt measures for their prevention or control, congress, relying upon its competency, would not, in the event of an invasion of yellow-fever or cholera, be likely to pass, under the spur of popular apprehension, hasty or ill-considered and improvident legislation; indeed, it need only legislate with reference to the amount of the appropriation to be used by the commissioner in checking the progress of the disease.

It may be urged that all the work contemplated in the establishment of this bureau could be equally well done by the medical officers of the army, the navy, or the Marine Hospital Service. These services are, however, created for limited and special purposes, and their officers have not the general training possessed by the sanitary officers of civil life, who deal with men, women, and children under different conditions of age, occupation, and habits of life. A bureau whose officers are appointed from civil life would more surely harmonize with and secure the confidence of the medical profession, as is shown by the repeated action of the American Public Health Association in asking for a distinct organization for the protection of the public health.

This bill was reported from the Committee on Commerce of the last congress, but could not be taken up in the house on account of lack of time.

Your committee recommend the passage of the bill with the following amendment: At the end of section 5 add, "subject to the approval of the secretary of the interior."

It will be noticed that the Committee on Commerce wisely call attention to the fact that the preparation of rules and regulations, so far as

they affect the quarantine service, would almost, as a matter of necessity, be prepared after full consultation with the various state and local health authorities of the country. The necessity of the closest possible alliance between these authorities and the proposed bureau should not need argument here, and we beg leave to refer to this Association the consideration of the question of the propriety of providing by national legislation for the holding of conferences in Washington, at such times as occasion may render necessary, of the representatives of the state boards of health and the commissioner of health.

REPORT OF COMMITTEE ON STATE BOARDS OF HEALTH.

Your Committee on State Boards of Health has been interested in reviewing the results which have accrued since our Association began the custom of devoting a part of a day to a consideration of the work of state boards. It was at the twelfth meeting of the association (1884) that reports from some member of each state board began to be called for in this way. At that session members of state boards, as well as sanitarians in general, felt that, by hearing from other boards, new ideas were suggested and much valuable information received.

The methods of boards, and their needs as to quarantine, as to cholera and other communicable diseases, as to inspection and many other matters, were fully discussed. It was at this meeting of the boards that the resolution was introduced that formed our Committee on Disinfectants, and that the special Committee on State Boards of Health was ordered, with Dr. Conn, of New Hampshire, as its chairman.

The report made by that committee to this Association the next year did much to show the value of this special means of securing a knowledge of what was being done by the several boards, as well as of what more should be attempted.

In the responses of state boards at our 14th meeting (1886) opinions and experiences of great value were elicited from members of various boards. The subjects of quarantine and preventive measures as to all epidemic diseases were especially considered.

At our last meeting the report of our committee advised that instead of calling on each board for general remarks, they should be asked to answer each of the following questions:

1. What are the views of members of state boards of health as to whether state systems of quarantine should be replaced by a national system?

2. What are the privileges and experiences of state health officers as to the investigation of epidemics at points in other states and provinces threatening to them?

3. What diseases should be subject to interstate notification, and should there be uniformity of method?

Much time was consumed on the first question, but all of them were the occasion of valuable remarks from various members. (See Vol. 13, 1887, pp. 335-350.)

The spring conference of state boards of health and the special conference held at this meeting serve each year to bring before state health officers the work accomplished or advised by other boards. We think the dilatory methods pursued in Florida for a year past, as to yellow-fever, plainly illustrate the need of a state board in every state. We know of no state in which local boards are efficient without the aid and coöperation of a state board.

As to the year just past, your committee begs to report as follows: The year has been one of great prosperity to most of the boards. The State Board of Health of Massachusetts at once shows the advantage of its return to its former position, and with new enthusiasm and enlarged powers is doing a valuable work for the state and for the country.

Michigan, in addition to the sustentation and extension of its usual work, is favored with a fully equipped biological laboratory in charge of those long recognized by us as valued members of this Association. It can be said, we believe, of all the other boards which had become established, and which had at all adequate appropriations, that they have grown in popular consideration and still more commended themselves to those best fitted to judge of their scientific or administrative work. In several of the states, as well as in the Canadian provinces, the legislatures have given increased power to boards.

The Board of North Carolina has been put upon a more effective basis, and that of Virginia is likely to have its appropriation restored. Missouri and Arkansas are still embarrassed for want of funds, but individuals who are members of this Association are faithful in their efforts to secure progress.

In order to avoid diffuseness and economize time, and yet secure valuable information, your committee would advise the following course for the conference this afternoon, and ask that one from each state be heard in answer to the following questions:

1. What new legislation has been secured by your board, or in aid of local boards, the past year? [1]

2. Have you had illustrations of the value of interstate notification of disease?

3. Have you a state collection of vital statistics, and if so in whose charge?

4. How far has sanitary survey in general, or house to house inspection in particular, been carried out in your state?

Each board to be allowed five minutes and no extension of time, but at the close more time to be given for continuation and general discussion, at the option of the Association.

[1] These four questions should be printed in the programme of the Association the morning before the discussion occurs in the afternoon.

REPORT OF THE COMMITTEE TO CONSIDER AND REPORT UPON SUCH SANITARY AND MEDICAL SERVICES ON BOARD EMIGRANT PASSENGER VESSELS AS MAY BE SUBJECT TO CONGRESS.

The particular deficiencies of the emigration laws of the United States for the protection of the health and the treatment of the sick on board ship, and to protect the country against the importation of dependent persons and infectious diseases, are comprehended in the following extracts from the most recent congressional enactments:

SECTION 1. . . . That it shall not be lawful for the master of a steamship or other vessel whereon emigrant passengers, or passengers other than cabin passengers, have been taken at any port or place in a foreign country or dominion (ports or places in foreign territory contiguous to the United States excepted) to bring such vessel and passengers to any port or place in the United States unless the compartments, spaces, and accommodations hereinafter mentioned have been provided, allotted, maintained, and used for and by such passengers during the entire voyage; that is to say, in a steamship the compartments or spaces unobstructed by cargo, stores, or goods shall be of sufficient dimensions to allow for each and every passenger carried or brought therein one hundred cubic feet if the compartment or space is located on the main deck or on the first deck next below the main deck of the vessel, and one hundred and twenty cubic feet for each passenger carried or brought therein if the compartment or space is located on the second deck below the main deck of the vessel, and it shall not be lawful to carry or bring passengers on any deck other than the decks above mentioned. And in sailing vessels such passengers shall be carried or brought only on the deck (not being an orlop deck) that is next below the main deck of the vessel or in a poop or deck-house constructed on the main deck, and the compartment or space unobstructed by cargo, stores, or goods shall be of sufficient dimensions to allow one hundred and ten cubic feet for each and every passenger brought therein, and such passengers shall not be carried or brought in any between decks, nor in any compartment, space, poop, or deck-house the height of which from deck to deck is less than six feet. In computing the number of such passengers carried or brought in any vessel children under one year of age shall not be included, and two children between one and eight years of age shall be counted as one passenger. . . .

SEC. 5. That in every such steamship or other vessel there shall be properly built and secured or divided off from other spaces two compartments or spaces to be used exclusively as hospitals for such passengers, one for men and the other for women. The hospital shall be located in a space not below the deck next below the main deck of the vessel, and not elsewhere. The hospital space shall in no case be less than the proportion of eighteen clear superficial feet for every fifty such passengers who are carried or brought on the vessel, and such hospitals shall be supplied with proper beds, bedding, and utensils, and kept supplied throughout the voyage. And every steamship or other vessel carrying or bringing emigrant passengers, or passengers other than cabin passengers, exceeding fifty in number, shall carry a duly qualified and competent surgeon or medical practitioner, who shall be rated as such in the ship's articles, and who shall be provided with surgical instruments, medical comforts, and medicines proper and necessary for diseases and accidents incident to a sea voyage and for the proper medical treatment of such passengers during the voyage, and with such articles of food and nourishment as may be proper and necessary for preserving the health of infants and young children; and the services of such surgeon or medical practitioner shall be promptly given in any case of sickness or disease to any of the passengers or to any infant or young child of any such passengers who may need his services. (Act of July 22d, 1882.)

* * * * * * * *

It shall be the duty of the state commissioners, etc., to examine into the condition of the passengers on arrival and of the ship carrying such passengers. If a convict, lunatic, idiot, or any person unable to take care of himself, without becoming a public charge, be found on board such vessel, the commissioners shall report the same in writing to the collector of customs. Such person shall not be permitted to land. (Act of August 3d, 1882.)

In evidence of the evasions and transgressions of the laws, in reply to inquiries your committee has been kindly furnished with the following:

QUARANTINE, S. I., October 27, 1888.

DEAR DOCTOR: The violation of the law in relation to over-crowding on steamers bringing emigrant passengers that arrive at the port of New York is frequent during the flush of the emigrant season, which is commonly from April 1st to July 1st following.

Over-crowding during this period is frequent: particularly has this been the case on steamers from the Mediterranean ports during the past season. I recall the following: S. S. Comorin, 1,263; Cachemere, 1,411; Bohemia, 1,280; Chateau Yquem, 1,228; Alesia, 1,018; Cashar, 1,520. These were all passengers in the steerage.

Prosecutions for this violation have in several instances been made, but I have no knowledge of an instance in which the penalty has been enforced.

The condition of the atmosphere in the steerage of over-crowded steamers during storms or rough seas is seriously detrimental to the health of the emigrants.

The condition of the closets in such steamers is usually filthy. The hospital arrangements on emigrant steamers have been much improved during the last few years. Hospital rooms of sufficient capacity for the sick are not generally provided. The port lights for the admission of air to rooms of well passengers can be regulated with intelligent discretion; but the sick, when placed in the small room usually assigned to the sick, have the port lights closed in obedience to an impression that the fresh air is injurious; the limited amount of fresh air in the "seven by nine" room occupied is quickly exhausted, and the patient suffers necessarily the depression which impure air and defective ventilation causes.

A law which would provide for an extra surgeon for over six hundred passengers and *punish* any violation would be salutary. It is impossible for one medical officer with this number of passengers to administer to their needs in many instances.

The inspection of passengers twice daily, so necessary to detect contagious diseases in their *initial* stage, it is impossible for him to faithfully attend to in connection with other duties. This is particularly true during the first few days of a voyage, when many are sea-sick, or when there is a rough sea or stormy weather.

An assistant surgeon capable of examining the emigrants and detecting diseases of that character is essential.

The location of hospitals on emigrant steamers has been and to some extent still is very improper. There is no provision in the General Passenger Act of 1882—the latest act, I believe, of the general government designed to improve the "Emigrant Laws of the United States"—in relation to the location of hospitals.

No coercive power exists by which quarantine or health authorities can compel the location of hospitals in any particular portion of the steamer, except that which exists in the punishment by detention of passengers when exposure of the well to the sick of contagious diseases is the result of imperfect isolation.

This I have frequently felt compelled to inflict, not for the punishment of the line or of those interested financially in the steamer, but for the protection of the public.

Sincerely,

WILLIAM M. SMITH,
Health Officer.

A. N. BELL, M.D.

Statement of Reports made to the Collector of Violations of the first section of the Passenger Act, approved August 2, 1882, *in bringing to the port of New York passengers other than cabin passengers, in vessels in excess of their legal capacity, from November*, 1882, *to August*, 1888.

Date of arrivals.	Nation-ality.	Steamship.	Port.	No. Statute passsengers brought.	Legal capacity.	No. passengers in excess.
1882.						
Nov. 19	German	Polaria	Hamburg	857	831	26
22	British	Tyrian	Leghorn	226	187	39
1883.						
May 4	Danish	Heimdal	Copenhagen	440	388	52
13	German	Australia	Hamburg	632½	563	69½
17	French	Alesia	Marseilles	1162	1046	116
19	British	Elysia	Med. Ports	958	887	71
21	German	California	Hamburg	1030	932	98
June 28	Danish	Heimdal	Copenhagen	397½	388	9½
1884.						
May 12	German	Australia	Hamburg	562	556½	5½
25	"	Polaria	"	864	812	52
June 28	"	Elbe	Bremen	1048½	959½	89
1885.						
May 14	German	Rhein	Bremen	742½	608	134½
24	French	Scotia	Marseilles	478	449	29
June 17	German	Martha	Stettin	499½	474	25½
1886.						
April 13	Italian	Indipendente	Med. Ports	488½	390	98½
26	British	Cilurnum	Naples	635	500	135
May 20	French	Poitou	Med. Ports	634½	548	86½
25	"	Alesia	" "	632	613	19
June 1	British	Nevada	Liverpool	799½	754	45½
4	"	Olympia	Med. Ports	534½	493	41½
July 16	Italian	Archimede	" "	373	287	86
Oct. 16	German	Eider	Bremen	625	578	47
25	Italian	Indipendente	Med. Ports	641½	496	145½
Nov. 18	"	Entella	" "	522½	463	59½
27	German	Aller	Bremen	648	594	54
1887.						
March 9	French	Cheribon	Naples	1158½	739	419½
April 13	"	Chandernagor	"	1231	965	266
May 15	Dutch	Edam	Amsterdam	632	574	58
22	"	Schiedam	"	615½	487½	128
June 1	British	Circassia	Glasgow	796½	768	28½
4	Dutch	Zaandam	Amsterdam	647	587	60
Dec. 12	French	Chandernagor	Marseilles	1247	1214	33
April 26	British	Circassia	Glasgow	711	642	69
1888.						
April 27	Italian	Robilant	Med. Ports	1291½	1126	165½
29	Dutch	P. Caland	Rotterdam	587½	560	27½
May 3	"	Rotterdam	"	339½	317	22½
3	Italian	Entella	Med. Ports	639	619	20
15	British	Alexandria	" "	600½	571	29½
20	Dutch	Schiedam	Amsterdam	530½	488	42½

RECAPITULATION OF THE ABOVE.

Number brought in excess of legal capacity	during the	year	1882	63
"	"	"	1883	416
"	"	"	1884	146½
"	"	"	1885	189
"	"	"	1886	818
"	"	"	1887	1062
"	"	"	1888	307½
				3004

Among the subterfuges resorted to for evading the law wherever it reads "whereon emigrant passengers or passengers other than cabin passengers," *first* cabin passengers and *saloon* passengers are construed into exemptions from the legal requirements defining specific accommodations.

The letter of the law requiring "a duly qualified and competent surgeon or medical practitioner, who shall be rated as such in the ship's articles," etc., is construed to have no relation whatever to preventive measures: of these the master of the ship only is the judge.

The status and quarters of the "medical officers," and the menial duties required of them, are such as virtually to exclude competent surgeons or medical practitioners. With rare exceptions, they have no tenure of office beyond the voyage, or official status above that of a petty officer, have no steward, apothecary, or nurse to aid them in their duties other than such as may be provided out of incompetents in emergency, when the best qualifications are the most needed. And for remuneration, they, for the most part, depend more upon what they make out of the passengers than they do upon their salaries. That medical practitioners who accept such degraded positions, who for the first time encounter Asiatic cholera, should attribute its symptoms to perforation of the intestines by ascarides lumbricoides, as the surgeon of the cholera ship Britannia did, a year ago, is to be expected.

The incompetency and the restricted duties of the medical practitioners employed on board emigrant vessels greatly add to the facilities with which the laws are violated, but they render defects in the laws all the more apparent.

To better protect the health of emigrants and the country against importation of infectious diseases and excessive emigration—especially of dependent persons—your committee recommends that the law be amended as follows:

1. That wherever the dimensions to allow for each and every passenger carried or brought therein, the figures and words read one hundred (100) and one hundred and ten (110) cubic feet, two hundred and fifty (250) cubic feet be substituted; and wherever the words and figures read one hundred and twenty (120), three hundred (300) cubic feet be substituted. And that the provision which reads, "In computing the number of such passengers carried or brought in any vessel, children under one year of age shall not be included, and two children between one and eight years of age shall be counted as one passenger," be stricken out.

That, in addition to the two hospitals now provided for under the law, there shall be a third hospital of equal capacity, respectively, with the others, as distant from those as practicable, thoroughly ventilated and arranged for special care of contagious diseases.

Wherever the words "cabin passengers" occur, they should be made to read *first* cabin and *saloon* passengers.

That section 5 of the Act of July 22, 1882, which requires that

"Every steamship or other vessel carrying or bringing emigrant passengers or passengers other than cabin passengers, exceeding fifty in number, shall carry a duly qualified and competent surgeon or medical practitioner," besides the amendment of the words cabin passengers, be further amended, after the first occurrence of the word "practitioner," to read as follows:

It shall be his first duty to examine every proposed passenger antecedent to admission, with special reference to the prevention of small-pox, and to report to the master of the ship every one without evidence of effectual vaccination or of having had small-pox, and every such person shall be excluded until effectually vaccinated.

And where the number of such passengers and crew is over six hundred, a junior or assistant surgeon or medical practitioner in addition shall be appointed. And the services of such surgeons or medical practitioners shall be promptly given without fee in every case of sickness, disease, or accident originating on board and incident to the voyage to any of the passengers or crew, or to any infant or young child of any such passenger who may require their services; and the medical officer where there is but one, and the senior where there are two, shall also be required to perform the duties of sanitary officers; to make daily inspections of all inhabitable portions of the vessel, and daily reports in writing thereon to the master of the steamship or passenger vessel, together with such suggestions and recommendations as in his judgment may be necessary to the preservation of health on board. He shall also exercise constant vigilance in regard to the condition of the provisions and water, and promptly report to the master anything which may appear to him to be deleterious to the health of any person on board. And for the prompt exercise of these functions and the maintenance of the respect to which such medical and sanitary officers are entitled, they shall be provided with a steward or apothecary competent to dispense medicine under their direction and for their special service; and their tenure of office, remuneration, and right to quarters, subsistence, and attendance shall be upon the same basis as and coördinate with the purser of the vessel on which they serve. Moreover, it shall be the duty of the sanitary and medical officers of every steamship or other vessel carrying or bringing passengers to the United States to report in writing, under oath, to the health officer of the port at the port of arrival, in detail, every case of illness or accident, with the nature and the result thereof, and every case of imbecility or insanity which may have fallen under his observation, and upon all the conditions herein provided for the protection and preservation of the health of all persons on board, and for the protection of the United States against the emigration of persons excluded by Section 2 of the "Act to Regulate Emigration" of August 3, 1882.

For a violation of these provisions, or either of them, or the disregard of the recommendations made in writing by the medical and sanitary officers as herein provided, the company to which the steamship or

other passenger vessel belongs shall be liable to a penalty not exceeding two hundred and fifty dollars in every case.

Respectfully submitted.

A. N. BELL, M. D., *Chairman.*
SAMUEL P. DUFFIELD, M. D.
A. R. RICE, M. D.

REPORT OF THE SPECIAL COMMITTEE ON THE TRANSPORTATION OF DEAD BODIES.

The special committee to whom was referred a communication from the National Association of General Baggage Agents relative to the adoption of rules for the transportation of the dead, which shall be uniform throughout the United States and Canada, respectfully recommend the adoption of the following resolution in relation thereto:

Resolved, That this Association heartily approves the effort of the National Association of General Baggage Agents, as set forth in the communication above referred to, and that it recommends all boards of health and health authorities to coöperate with said National Association of Baggage Agents in perfecting rules for the transportation of the dead which shall be uniform in their requirements; but the first and controlling object of which shall be to secure the public from danger in such transportation. To secure this, the essential requirement of such rules should be the thorough preparation of the dead body, and the disinfection of all accompanying articles which have been exposed to infection in accordance with the principles recommended by the committee of this Association of Disinfection and Disinfectants, and that no dead body shall be received for transportation in any public conveyance without a permit from the board of health in the locality in which the death occurred, which shall show that the above requirements have been fully complied with, and that, in the judgment of such board the body may be transported with safety to the place to which it is desired to remove it.

PETER H. BRYCE.
J. T. REEVE.
LEWIS BALDY.

[The foregoing resolution is better understood by reference to the following communication.—SECRETARY.]

NATIONAL ASSOCIATION OF GENERAL BAGGAGE AGENTS,
SECRETARY'S OFFICE,
DETROIT, MICH., August 1, 1888.

I. A. WATSON, M. D., *Secretary A. P. H. Association, Concord, N. H.:*

DEAR SIR: At a meeting of the National Association of General Baggage Agents, held in the city of New York, July 17, 1888, the question of Transportation of Dead Bodies was referred to a committee of seven for recommendations, with the view of establishing some simple, effective rules which could be the guide for all railroads and other transportation companies in the United States and Canada, in the matter of transporting dead bodies.

At a subsequent meeting, the following rules were submitted, with the recommendation that they be referred to a sub-committee to lay before the several state boards of health, National Conference of State Boards of Health, and National Association of Undertakers, for any recommendations they would make in the matter; and after such correspondence, said committee to send copies of corrected rules to all members of the Association

prior to the next regular meeting, which will be held at San Francisco, January 16, 1889. The rules are as follows, viz.,—

1. The transportation of the bodies of persons dead of small-pox, Asiatic cholera, typhus fever, or yellow-fever is absolutely forbidden.

2. The bodies of those who have died of diphtheria, scarlet-fever, typhoid fever, erysipelas, measles, and other contagious, infectious, or communicable diseases, must be wrapped in a sheet thoroughly saturated with a strong solution of chloride of zinc, in the proportion of one half pound of chloride of zinc to a gallon of water; or a strong solution of not less than two per cent. of the bi-chloride of mercury, and encased in an air-tight zinc, copper, or lead-lined coffin, or in an air-tight iron casket, and all enclosed in a strong, tight wooden box. The coffin or casket must also be surrounded in space between coffin and outside box by sawdust saturated with a solution of chloride of zinc, or bi-chloride of mercury of same strength as above.

3. In cases of contagious, infectious, or communicable diseases, the body must not be accompanied by persons who, or articles which, have been exposed to the infection of the disease. And in addition to permit from board of health, agents will require an affidavit from the shipping undertaker, stating how body has been prepared, and kind of coffin or casket used, which must be in conformity with Rule 2, and that the health officer of the locality to which the body is consigned has consented to the proposed shipment, and has had such timely notice of the hour of its arrival within his jurisdiction as will enable him to supervise its reception.

4. The bodies of persons dead of diseases that are not contagious, infectious, or communicable, may be received for transportation to local points in same state, when encased in a sound coffin or metallic case, and enclosed in a strong wooden box securely fastened, so it may be safely handled. But when it is proposed to transport them out of the same state, or to another state, they must be encased in an air-tight zinc, copper, or lead-lined coffin, or in an air-tight iron casket. If any other kind of coffin is used, the body must be properly embalmed.

5. Every dead body must be accompanied by a person in charge, who must be provided with a ticket, and also present a full first-class ticket marked "Corpse," and a permit from board of health giving permission for the removal, and showing name of deceased, cause of death, and whether of a contagious or infectious nature.

6. The permit from board of health must be issued in duplicate, the original to accompany body to destination; the duplicate copy will be retained by agent at initial point, and sent to the general baggage agent.

7. It is intended that no dead body shall be moved which may be the means of spreading disease; therefore all disinterred bodies, dead from any disease or cause, will be treated as infectious and dangerous to public health, and will not be accepted for transportation unless said removal has been approved by the state board of health, and the consent of the health officer of the locality to which the corpse is consigned has first been obtained.

In submitting these rules for your consideration, it is not assumed that they are now perfect, and we are simply asking your approval of them. On the contarry, we solicit any suggestions or recommendations which, in your opinion, will be in the interests of the public health, and at the same time not unnecessarily burdensome and expensive to the public.

It is a noticeable fact that infectious or communicable diseases follow more quickly the lines of communication, being spread by the movements of the people; and as the railroads are the principal medium of communication among the people, the trunk lines spanning the continent, bringing to our doors inhabitants from all parts of the country, it is patent to all that local rules, be they ever so rigid, can afford but partial protection, and as the bodies of the dead are transported in the same cars and among the baggage containing the wearing apparel of the passengers, the necessity for some effective rules, which will apply the same in Pennsylvania as in Colorado, is the more apparent. Cannot this be accomplished, and may we have your coöperation to that end?

In looking over the above rules the following inquiries are suggested: Is it policy to have a list of specified dangerous diseases that will not be carried, as in Rule 1, and should this list stand, or be extended?

There being a difference of opinion among health officers as to danger in transporting bodies dead of certain diseases, should we not take the safe side in case of doubt as in first part of Rule 2?

Will the rule for preparing bodies for shipment be effective, or should there also be an injection of fluids in the cavities? What should be the extra expense of thus preparing dead bodies?

What should be the additional expense of ordinary air-tight zinc, copper, lead-lined, or iron coffins or caskets, as compared with other ordinary coffins or caskets that are not claimed to be air-tight? The question of expense in this matter is a very serious one, and of course must not be overlooked: will this scheme be prohibitory in the case of people of ordinary or limited means?

Is there any standard by which undertakers are graded, to ascertain whether competent or not? Are they examined before being allowed to practise the art of embalming, as are physicans before practising their profession? If not, what assurance have the public of any safety, even though a certain undertaker made oath that he had prepared a body for shipment in accordance with the rules? Should not each state require an undertaker to take out a license and pass examination before a competent board of examiners before he is allowed to prepare a dead body for shipment out of that state?

Is there any penalty in your state for making false affidavit or issuing false certificate either as to cause of death or as to preparation of the body for transportation? And if not, should there not be some legislation that will give the necessary protection? Who, in your opinion, should look after this matter?

Is it not desirable that all permits for the removal of dead bodies be issued by the boards of health, and can this not be done in all cases even in small towns or country districts?

Is it not desirable that a nearly uniform style of removal permits be used, to insure definite and necessary information, to enable persons to transport dead bodies through several states without danger of being stopped at some intermediate point? Please send samples of permits used in your territory.

To enable the committee to prepare their report, we would request that all communications on the subject be sent to the secretary at Detroit, Mich., on or before December 1.

H. P. Dearing,
J. C. Lenix,
F. A. Zimmerman,
Sub-Committee.

J. E. Quick, *Secretary.*

REPORT OF COMMITTEE ON THE LOMB PRIZES.

Your committee, to whom were referred the essays upon "Practical Sanitary and Economic Cooking Adapted for Persons of Moderate and Small Means," respectfully report that they have perused with thoughtful and considerate attention the three score and ten essays which were submitted to them.

A few of them were presented in beautiful specimens of type-writing, but the great majority of them were in manuscript, and some of them not in the most legible characters, a circumstance which, it will be appreciated, became an important matter, when considered in connection with the large number of competitors, and the fact that many of their papers were each of several hundred pages in length.

The result of the labors of the committee is, that by unanimous approval, the first prize of $500 is awarded to the author of the essay

bearing this inscription,—"The Five Food Principles, illustrated by Practical Recipes."

Your committee would further report that although there were among the remaining sixty-nine a number of essays of considerable merit, there was no single one so prominently superior to others as to command the approval of the majority of your committee, nor was there any which did not contain some errors of statement, which your committee did not feel justified in endorsing with the approval of this Association by the bestowal of a prize, or else which did not fail to meet some of the conditions upon which the prize was offered, or which was not otherwise objectionable because of literary defects.

Your committee would therefore respectfully report that no essay was found among those submitted to them which they judged deserving of the second prize of $200.

The committee consider it a duty, in awarding the prize, to emphasize the fact that of all the essays submitted the one selected is not only preëminently the best, but that it is also intrinsically an admirable treatise on the subject.

It is simple and lucid in statement, methodical in arrangement, and well adapted to the practical wants of the classes to which it is addressed. Whoever may read it can have confidence in the soundness of its teachings, and cannot fail to be instructed in the art of cooking by its plain precepts, founded as they are upon the correct application of the scientific principles of chemistry and physiology to the proper preparation of food for man.

All of which is respectfully submitted.

C. A. Lindsley.
George H. Rohé.
V. C. Vaughan.
Ellen H. Richards.
Emma C. G. Polsom.

REPORT OF THE ADVISORY COUNCIL.

Milwaukee, Wis., Nov. 22, 1888.

Gentlemen of the American Public Health Association:

The Advisory Council beg leave to report that they met as per appointment, when the following proceedings were had:

Dr. Henry P. Walcott, of Massachusetts, was called to the chair, and Dr. H. C. Dunnavant, of Arkansas, was elected secretary.

It was moved to adjourn for dinner. Motion withdrawn.

Dr. Jones, of Kansas, moved to adopt the resolution offered the society in the morning as regards legislation against patent medicines, but the

motion was withdrawn, and the resolution was referred to the Executive Committee for consideration.

Dr. Walter Wyman moved that Dr. Raymond, of Brooklyn, N. Y., be allowed to make a statement.

Carried, and Dr. Raymond presented and urged the acceptance of an invitation to hold the next meeting of the American Public Health Association in Brooklyn, N. Y.

Meeting at Brooklyn opposed by Dr. Salomon.

Dr. Rohé presented an invitation to meet at Baltimore.

The chairman presented an invitation to meet at Chattanooga, Tenn.

Dr. John H. Rauch moved that the invitation to meet at Brooklyn be accepted.

Motion adopted, and Brooklyn recommended as place for next meeting.

Moved and seconded that it be put on record, and Chattanooga notified that it is the desire of the American Public Health Association to meet in their city some time in the future.

Dr. Conn moved that we proceed to the election of officers. Adopted.

Dr. Rohé nominated Dr. Henry B. Baker for president.

Dr. H. A. Johnson nominated.

On motion, nominations closed, and a vote being taken, Dr. H. A. Johnson was declared elected as president for the ensuing year.

Dr. Cochran, of Alabama, and Dr. C. A. Lindsley, of Connecticut, were nominated as first vice-president, and a vote being taken resulted in the election of Dr. Cochran as first vice-president.

Dr. Bryce nominated Dr. Montizambert as second vice-president. Elected.

Moved, that the secretary cast the ballot for the committee for Dr. J. B. Lindsley of Tennessee for treasurer. Carried. Elected.

Col. D. P. Hadden, Dr. J. F. Kennedy, Dr. P. H. Bryce, and Dr. Walter Wyman were put in nomination for members of the Executive Committee, and on a vote being taken, Col. D. P. Hadden, Dr. Kennedy, and Dr. Bryce were declared elected.

On motion, committee adjourned.

All of which is respectfully submitted.

HENRY P. WALCOTT, *Chairman.*

H. C. DUNNAVANT, *Secretary.*

MILWAUKEE, WIS., Nov. 23, 1888.

The Advisory Council having called to mind the fact that the constitution declares a person ineligible for two successive terms on the Executive Committee, called a meeting for the purpose of nominating a person for that position in the place of Col. D. P. Hadden, previously nominated, and Dr. Walter Wyman was nominated to fill the vacancy.

HENRY P. WALCOTT, *Chairman.*

H. C. DUNNAVANT, *Secretary.*

REPORT OF THE COMMITTEE ON NECROLOGY.

Orlando Williams Wight, A. M., M. D., attorney-at-law, died in Detroit, Mich., October 19, 1888.

The causes leading to his death were,—the ceaseless and severe toil of a lifetime, tropical fever contracted during his recent journey around the world, and fatigue in the preparation of his last work.

He was born February 19, 1824, at Centreville, Alleghany county, New York. His father was a descendant of Thomas Wight, who came to this country from the Isle of Wight in 1635, and settled at Dedham, Mass., being "driven from his country by the religious persecutions of the time." His mother, still living, is a Van Buren, being a descendant of the same family as Martin Van Buren. His early life was spent in toil and study. He soon went beyond the instruction of the common school. He then studied Latin and Greek without a teacher, occasionally attending a term at the academy in Pike or Westfield. And from time to time he taught in one of the common schools.

At the age of twenty-one he left home with high aims and a laudable ambition to make his way in the world. He was the successful principal of Geneva academy, Geneva, N. Y., for a time. While there he was a comprehensive and thorough student of history. He admired the civilization, the culture, and the poetry of ancient Greece. He was a diligent student of the literature and laws of old Rome. From Geneva he went to New York city, where he was engaged in writing for the *Democratic Review*, the *Whig Review*, and the current magazines. He wrote tersely, rapidly, eloquently, and effectively. He was one of the knight-errants of literature.

Soon after, he went to Newark, N. J., where he was installed as pastor of the Universalist church by the Rev. E. H. Chapin. During his residence there, and while he was abroad, and for some time after his return home, he brought out the following literary works: A translation of Victor Cousin's System of Philosophy; a translation of Victor Cousin's work on The True, Beautiful, and Good; an edition of the philosophical works of Sir William Hamilton; a romance of Abelard and Heloise, in which was an original translation of their famous letters; translations of a number of Balzac's works; an edition of the English classics; a Home Library, containing the biographies of the great men in history; an edition of Haslitt's Montaigne, the best English translation of that author; a translation of Madame de Staël's Germany, that ranks very high.

In 1853 Mr. Wight went to Europe for the purpose of studying the institutions and languages of the different peoples—German, French, and Italian. He spent some time in Ireland, Scotland, and England as well. He remained abroad four years, when he returned to America, as he said, after completing his university education. He lived in Brooklyn, N. Y., a short time, and then removed to Rye, where he built a beautiful house on a place that he called "The Cedars." From there he went to Carbondale, Pa., where he studied medicine. He had, however, read

medicine previous to this in his pursuit of knowledge. He attended his first course of lectures at the College of Physicians and Surgeons, New York. In 1865 the degree of Doctor of Medicine was conferred on him by the Long Island College Hospital, Brooklyn, N. Y. He began to practise medicine at Carbondale, Pa. From that place he removed to New Albany, Ind., remaining a brief time. He next settled at Oconomowoc, Wis., where he practised his profession and continued his literary work. In 1877 he went to Milwaukee, having been appointed health officer of that city. He occupied this position till 1881, when he received an invitation to go to Detroit, where he was appointed health officer. While he was health officer of Detroit he continued the literary work he had been engaged on in Milwaukee. Says the *Detroit Free Press*,—"In 1881, under the new law governing the health board of Detroit, he was invited to become the first health officer of the city, and accepted. His work here is familiar to all Detroiters, and is an index to the character of the man. Constant in his efforts, prudent in his actions, vigilant, aggressive when action demanded, fearless when an emergency arose, he raised the efficiency of the health office to a hitherto unknown level."

Weary with years of toil, weighed down by affliction, his restless spirit needed rest. In the spring of 1886 Dr. Wight resigned his position as health officer of Detroit, and set out on a journey around the world, visiting the principal countries of Europe from the North Cape to the Ægean Isles, by the way of the Suez canal crossing the ocean to New Zealand, and thence coming to San Francisco, and finally returning home. His last work, entitled "Peoples and Countries Visited in a Winding Journey Around the World," was completed a short time before his death. This work alone will place him among the first of English authors: it is a masterpiece of a gifted mind, of a catholic spirit, of broad views, and a generous heart.

While he was health officer of Detroit he published a valuable work on Maxims of Public Health. He also had nearly completed a work on the Constitution. He was well qualified for this work, having made a profound study of law. He had been admitted to practice in the federal courts. He had occasionally engaged in the practice of the law.

Dr. Wight was twice married. Not until after marriage did he know that his first wife was an incurable epileptic; she had been afflicted with this disease from early life. He obtained a legal separation from her, adopted her as his daughter, and after his second marriage cared for her in his own home. By his second wife he had three children, who all died in infancy. His second wife died while he resided at Oconomowoc. Those who knew the doctor intimately could see that his afflictions weighed heavily upon him, but he was a silent sufferer. And those who knew him best loved and respected him most.

In his early life Dr. Wight took an interest in philosophy and metaphysics, under which ran a deep curreent of religious feeling and thought. As time went on, as he used to say, he got over the metaphysics, but was always an admirer of Sir William Hamilton. He was

neither a mystic nor a stoic nor an agnostic. He was a profound believer in the elevating and the saving and the civilizing power of the teachings of Christ. He was ambitious to excel in learning, knowledge, and wisdom; but his ambition was laudable, containing a desire to confer benefits on others. Later in life he developed into the practical realist. He was a man of action as well as thought. He hated shams and pretensions, and respected success based on qualification and merit. He sympathized with the toiling masses, and did what he could to alleviate their condition. Everything that he did was well done. And none of his work stands forth in brighter and better view than what he did in the field of sanitation. His work in this field was done on the precept that was enunciated over eighteen hundred years ago, saying "My people perish for lack of knowledge." He was just, honest, truthful, and honorable. "Broad-minded, of exceptional natural abilities, indomitable in perseverence, unflagging in industry, self-educated, self-made, his works will survive him, and his personal influence will be potent long after his death." He was truly a man whose like is seldom seen.

Edwin Miller Snow, A. M., M. D., of Providence, R. I., died on Saturday, December 22, 1888. He was born in Pomfret, Vt., May 8, 1820, received academic education at New Hampton, N. H., collegiate education at Brown University, R. I., from which he graduated in 1845, and received his degree of A. M. in 1848. He pursued his medical course at the College of Physicians and Surgeons, New York, graduating in 1849. Soon thereafter he began the practice of his profession in Holyoke, Mass, but removed to Providence, R. I., the following year. He was married in Providence, May 2, 1850. During his practice in Holyoke in 1849, and in Providence in 1854, he saw about 150 cases of cholera, and became much interested in the study of its causes, which laid the foundation of his devotion to the study of preventive medicine, to which he gave almost exclusive attention in the subsequent years of his life, contributing many useful reports and papers to its promotion, particularly on vital and social statistics. He was for many years superintendent of health of Providence, and more recently registrar of vital statistics, and up to the time of his death. He was also, from time to time, state prison inspector, health officer of quarantine, member of the State Board of Charities and Correction, chairman of the board of cattle commissioners, etc. In 1872 he was state delegate to the International Prison Congress in London, and one of the United States official delegates to the International Statistical Congress at St. Petersburg.

He was a member of the Rhode Island Medical Society, and at different times secretary, vice-president, and president; of the American Medical Association; of the American Public Health Association vice-president and president; American Statistical Association, and other scientific bodies,—in all of which he was, as he also was in private life, and by all who knew him, highly esteemed for his quiet, unassuming life and congenial fellowship.

Nathan Allen, A. M., M. D., LL. D., of Lowell, Mass., died Jan. 1, 1889. He was born in Princeton, Mass., April 25, 1813. He was a graduate of Amherst college in 1836, received his M. D. from the Pennsylvania Medical College in 1841, and his LL. D. from his *Alma Mater* in 1873. He settled in Lowell in 1841, where he continued to reside up to the time of his death. He became a member of the Massachusetts Medical Society in 1842, and has since that time contributed many papers and special reports to its proceedings on subjects of local and professional interest. He was for many years member of the State Board of Charities and Correction, state commissioner of lunacy, examining surgeon for pensions, etc., member of the American Medical Association, American Academy of Medicine, American Public Health Association, and a frequent contributor to their proceedings; besides writing many essays on social statistics, physiological, pyschological, and sanitary subjects, and only last year compiled a volume of 350 octavo pages of his essays, with the title of "Physical Development: or, The Laws Governing the Human System." He was particularly devoted to the subject of physical exercise, and among the foremost advocates of its general introduction into educational institutions. As a trustee of Amherst college he took special interest in the introduction of physical education into that institution, and made it the subject of several essays. Dr. Allen was indeed a profuse essayist. He was married to Sarah H. Spaulding, daughter of Dr. Thaddeus Spaulding, of Wakefield, Mass., in 1841, who died without issue in 1856, and in 1858 to Annie W. Waters, daughter of Captain William C. Waters, of Salem, Mass., who survives him with four children.

Cornelius Rea Agnew, M. D., died at his residence in New York, April 18, 1888, in the fifty-eighth year of his age, after an illness of only a few days' duration—a peritonitis understood to have originated as a typhlitis. He was born in New York, August 8, 1830. He entered Columbia college at the early age of fifteen years, and graduated from that institution in 1849. He soon after began the study of medicine under Dr. J. Kearney Rogers, attended the regular course of lectures in the College of Physicians and Surgeons, and while so engaged became walker, and, after graduation in 1852, house surgeon. Two years after graduation he went to Houghton, a small town on Portage lake, N. Y., where he practised his profession one year, and returned to New York. He was soon afterward appointed resident surgeon to the Eye and Ear Infirmary, and shortly thereafter went to Europe to complete his studies to comply with the conditions of his appointment, where he remained a year, most of the while in walking the hospitals of Dublin and Paris. On his return to New York he established himself as a general practitioner, but still held his position as surgeon to the Infirmary till April, 1864, when he resigned, to enter upon what he always considered the most important work of his life—the duties of United States sanitary commissioner—to which he was appointed, and of which he

was one of the organizers. He was appointed surgeon-general of the state of New York by Governor Morgan in 1858, and, at the commencement of the civil war, medical director of the State Volunteer Hospital, New York, in which he performed efficient service.

On the conclusion of his service as sanitary commissioner he returned to his home and resumed practice in the specialties of eye and ear diseases, in which he had already become well known. In 1866, by request, he established in the College of Physicians and Surgeons an Opthalmic Clinic, and three years later was elected clinical professor of diseases of the eye and ear, a position which he still held up to the time of his death. In 1868 he originated the Brooklyn Eye and Ear Hospital, and in 1869 the Manhattan Eye and Ear Hospital of New York.

Although one of the busiest of practitioners in the specialty of his choice, in which he ranked among the foremost, he was, notwithstanding, *au courant* in the whole field of medical progress, while he was also a talented and public-spirited citizen. He was one of the managers of the New York Hospital for the Insane at Poughkeepsie; one of, and subsequently president of, the board of trustees of public schools in New York; one of the trustees of Columbia college, and one of those chosen to organize the School of Mines; was secretary of the first society organized in New York for sanitary reform, and a member of the committee that prepared the first draft of the city health laws. "The Importance of Sanitary Science, and Some of the Relations of the Medical Profession to Education," was the subject of his inaugural address as president of the Medical Society of the State of New York, in 1873. He became a member of the American Public Health Association in 1872.[1]

Homer Owen Hitchcock, M. D., son of David Hitchcock, was born at Westminster West, Vt., January 28, 1827. He was educated at Kimball Union Academy and Dartmouth college, graduating from the latter in 1851. Commenced the study of medicine in 1851 at the College of Physicians and Surgeons, New York city, graduating from the same in 1855. He commenced the practice of medicine in Kalamazoo, Mich., where he resided since 1856. He was a member of the American Medical Association, Michigan State Medical Society, and ex-President of the Michigan State Board of Health. In 1856 he married Miss Fidelia W. Wellman, of Cornish, N. H., who died December 8, 1874, leaving two sons and a daughter. In 1875 he married Miss Kate B. Wilcox, of Orford, N. H., who, with their one son and the older sons and daughter, survives him.

He was elected a member of the American Medical Association in 1863, and was frequently appointed a delegate to that body by the Michigan State Medical Society. In 1886 he was appointed a delegate to the British Medical Association, which convened at Brighton, and was elected a member of that association.

Dr. Hitchcock's full recognition of the close relation of hygiene to

[1] The above Necrologies are from *The Sanitarian.*

social advancement and human welfare, and the efficiency of wise legislation in protecting and promoting public health, is indicated by the character of his later productions in the published proceedings of the Michigan State Medical Society. The earnestness and success attending his efforts and investigations in this direction doubtless influenced Governor Bagley, in 1873, to select him as the first appointed member to organize the Michigan State Board of Health. At the first meeting of this efficient and most useful board, he read a paper carefully outlining its work for the future. He was unanimously chosen its first president, and continued to hold that important office until April, 1877. Although again reëlected, he declined, stating that "Having held the office since the organization of the board, and feeling that there were other members equally deserving the honor, he respectfully declined to accept the office for another term." He continued, however, to serve actively and most acceptably as a member of the board until July, 1880, when other duties and responsibilities compelled his resignation. In September, 1872, he was elected a member of the American Public Health Association.

ANNUAL REPORT OF DR. J. BERRIEN LINDSLEY,

Nashville, Tennessee, Treasurer of the American Public Health Association, November 20, 1888.

RECEIPTS.

Balance brought forward, ...	$930.35	
From annual fees of members, ...	1,990.00	
From sale of *Public Health*, ...	25.11	
From sale of *Disinfection and Disinfectants*, .	293.75	
		$3,239.21

DISBURSEMENTS.

Printing, binding, and distributing Vol. XIII of *Public Health*, and 1,000 copies of *Disinfection and Disinfectants*, ...	$1,923.53	
Secretary's help, ...	250.00	
Treasurer's postage and help, ...	80.32	
Secretary's travelling expenses and postage, .	144.82	
Treasurer's travelling expenses, ...	56.80	
		2,455.47
Balance to new account, ...		$783.74

The above expenditures were ordered by the Executive Committee, and vouchers are herewith submitted.

Memorandum. The six hundred copies of the extra volume on *Disinfection* will doubtless refund the cost incurred by its publication.

All of which is respectfully submitted by

J. BERRIEN LINDSLEY, *Treasurer.*

MILWAUKEE, Wis., Nov. 21, 1888.

To the President of the American Public Health Association:—

SIR: The undersigned, an auditing committee appointed to audit the Treasurer's accounts for the year ending November 20, 1888, respectfully report that they have examined the vouchers and find the same correct.

Very respectfully,

SAM'L W. ABBOTT.
J. T. REEVE.
F. MONTIZAMBERT.

CONSTITUTION

OF THE

AMERICAN PUBLIC HEALTH ASSOCIATION.

TITLE.

I. This Association shall be called "The American Public Health Association."

OBJECTS.

II. The objects of this Association shall be the advancement of sanitary science, and the promotion of organizations and measures for the practical application of public hygiene.

MEMBERS.

III. The members of this Association shall be known as Active and Associate. The Executive Committee shall determine for which class a candidate shall be proposed. The *Active* members shall constitute the permanent body of the Association, subject to the provisions of the constitution as to continuance in membership. They shall be selected with special reference to their acknowledged interest in or devotion to sanitary studies and allied sciences, and to the practical application of the same. The *Associate* members shall be elected with special reference to their general interest only in sanitary science, and shall have all the privileges and publications of the Association, but shall not be entitled to vote.

Delegates from national, state, provincial, and municipal boards of health, organized sanitary associations, and the army, navy, and marine hospital service, shall be entitled to be enrolled as active members upon presentation of their credentials to the Executive Committee. Members, not delegates from such bodies, shall be elected as follows:

Each candidate for admission shall first be proposed to the Executive Committee, in writing (which may be done at any time), with a statement of the business or profession and special qualifications of the person so proposed. On recommendation of a majority of the committee, and on receiving a vote of two thirds of the members present at a regular meeting, the candidate shall be declared duly elected a member of the Association. The annual fee of membership in either class shall be five dollars.

OFFICERS.

IV. The officers shall be a President, a First and Second Vice-President, a Secretary, and a Treasurer.

All the officers shall be elected by ballot, annually, except the Secretary, who shall be elected for a term of three years.

PRESIDING OFFICER.

V. The president, or in his absence, one of the Vice-Presidents, or in their absence, a chairman *pro tempore*, shall preside at all meetings of the Association. He shall preserve order, and shall decide all questions of order, subject to appeal to the Association. He shall also appoint all committees authorized by the Association, unless otherwise specially ordered.

SECRETARY.

VI. The Secretary shall have charge of the correspondence and records of the Association; and he shall also perform the duties of Librarian. He, together with the presiding officer, shall certify all acts of the Association. He shall, under the direction of the Executive Committee, give due notice of the time and place of all meetings of the Association, and attend the same. He shall keep fair and accurate records of all the proceedings and orders of the Association; and shall give notice to the several officers, and to the Executive and other Committees, of all votes, orders, resolves, and proceedings of the Association, affecting them or appertaining to their respective duties.

TREASURER.

VII. The Treasurer shall collect and take charge of the funds and securities of the Association. Out of these funds he shall pay such sums only as may be ordered by the Association, or by the Executive Committee. He shall keep a true account of his receipts and payments, and at each annual meeting render the same to the Association, when a committee shall be appointed to audit his accounts. If from the annual report of the Treasurer there shall appear to be a balance against the treasury, no appropriation of money shall be made for any object but the necessary current expenses of the Association, until such balance shall be paid.

STANDING COMMITTEES.

VIII. There shall be the following standing committees: (1) The Executive Committee, (2) the Advisory Council, (3) the Committee on Publication.

EXECUTIVE COMMITTEE.

IX. The Executive Committee shall consist (1) of the President, First Vice-President, Second Vice-President, Secretary, and Treasurer; (2) of six active members, of whom three shall be elected annually by ballot,

to serve two years, and who shall be ineligible to reëlection for a second successive term; and (3) of the ex-Presidents of the Association.

It shall be the duty of the Executive Committee to consider and recommend plans for promoting the objects of the Association; to authorize the disbursement and expenditure of unappropriated moneys in the treasury for the payment of current expenses; to consider all applications for membership, and, at the regular meetings, report the names of such candidates as a majority shall approve; and, generally, to superintend the interests of the Association, and execute all such duties as may, from time to time, be committed to them by the Association. At least one month preceding the annual meeting of the Association, the Executive Committee shall cause to be issued to members a notice of such meeting, and they are authorized to publish the same in medical, scientific, and other periodicals, but without expense to the Association; and such notice shall contain the order of business to be followed at said meeting, and, briefly, the subjects to be presented, and the special points of discussion.

ADVISORY COUNCIL.

X. The Advisory Council shall consist of one member from each State, Territory, and District, the Army, Navy, and Marine Hospital Service, the Dominion of Canada, and each of the Provinces, who shall be appointed by the President on the last day of each session, and who, besides acting as a nominating committee of officers for the ensuing year, to be announced at such time as the Executive Committee may appoint, shall consider such questions and make such recommendations to the Association as shall best secure the objects of the Association. They shall at their first meeting elect from their own number a Secretary, whose record of their proceedings shall be made part of the records of the Association.

COMMITTEE ON PUBLICATION.

XI. The Committee on Publication shall consist of the Secretary and two active members, selected by the Executive Committee, who shall contract for, arrange, and publish, under authority of the Executive Committee, the proceedings of the Association, including such papers as have been examined and approved by the Executive Committee, or which have been submitted to them by the latter for their discretionary action.

REPORTS AND PAPERS.

XII. All committees, and all members preparing scientific reports or papers to be laid before the Association at its annual meetings, must give, in writing, the title of such reports or papers, the time to be occupied in reading them, and an abstract of their contents, to the Executive Committee, at least one week preceding the date of such meeting, to secure their announcement in the order of business.

MEETINGS.

XIII. The time and place of each annual meeting shall be fixed at the preceding annual meeting, but may be changed by the Executive Committee for reasons that shall be specified in the announcement of the meeting. Special meetings may be called, at any time or place, by concurrence of two thirds of the Executive Committee. There shall be no election of officers, or change of By-laws, or appropriation of money to exceed the amount at that time in the treasury, at such special meeting, except by a vote of a majority of all the members of the Association. Whenever a special meeting is to be held, at least one month's notice shall, if possible, be given by circular, to all the members, together with the order of business.

QUORUM.

XIV. At the annual meeting nine members shall constitute a quorum for the election of officers, a change of the Constitution, the election of members, and the appropriation of moneys.

ORDER OF BUSINESS.

XV. The order of business at all meetings of the Association shall be fixed by the Executive Committee, and such order must be completed before any other business is introduced, except such order of business is suspended by a vote of four fifths present.

ALTERATION OF CONSTITUTION.

XVI. No alteration in the Constitution of the Association shall be made except at an annual meeting, nor unless such alteration shall have been proposed at a previous meeting, and entered on the minutes with the name of the member proposing the same, and shall be adopted by a vote of two thirds of the members present.

BY-LAWS OF THE EXECUTIVE COMMITTEE.

QUORUM.

1. Five members shall constitute a quorum for the transaction of such business as may come before the committee.

MEMBERS RESTRICTED.

2. No elective member of the Executive Committee shall be at the same time a member of the Advisory Council, if there is another member of the Association from his state or service.

PARLIAMENTARY USAGE.

3. Cushing's Law and Practice of Legislative Assemblies shall be the guide of parliamentary practice until otherwise ordered.

PAPERS.

4. All papers presented to the Association must be either printed, typewritten, or in plain handwriting, and be in the hands of the Secretary at least twenty days prior to the annual meeting, to insure their critical examination as to their fulfilling the requirements of the Association.

5. If any paper is too late for critical examination, said paper may be so far passed upon by the Executive Committee as to allow its reading, but such paper shall be subject to publication or non-publication, as the Executive Committee deem expedient.

6. All papers accepted by the Association, whether read in full, by abstract, by title, or filed, shall be delivered to the Secretary as soon as thus disposed of, as the exclusive property of the Association. Any paper presented to this Association and accepted by it shall be refused publication in the transactions of the Association if it be published, in whole or in part, by permission or assent of its author, in any manner prior to the publication of the volume of transactions, unless written consent is obtained from the Publication Committee.

7. Day papers shall be limited to twenty minutes, and evening papers to thirty minutes, each.

DISCUSSION OF PAPERS.

8. After the leading papers on each subject, as indicated by the Executive Committee, have been read, discussion shall follow, and be confined strictly to the subject of these papers; and each speaker shall be limited

to ten minutes, and shall not speak a second time until after every other member who desires to be heard, and then only for five minutes, except by unanimous consent.

9. The Chair shall notify gentlemen who desire to speak to send up their names, and they shall be called on in the order sent up, and he may, at his discretion, limit the time of speaking to five instead of ten minutes, if in his judgment it may become necessary to do so in order to allow each one on the list an opportunity to be heard.

PUBLICATION COMMITTEE.

10. The Committee on Publication, charged with the duties of selecting and printing the papers and transactions of the Association, shall consist of three active members of the Association, and of whom one shall be the Secretary, appointed by the Executive Committee during the session of the Association, and selected with reference to their facilities of meeting.

11. All papers read by title, and others not definitely passed upon by the Executive Committee, shall be referred to the Publication Committee for critical examination; and said committee is authorized to reject such papers as in its judgment are not worthy of publication, and to omit such others as cannot be included within the limits of the annual volume.

12. The Publication Committee shall procure a copyright on the transactions in the name of the Association, and the committee shall have full charge of the publication of the transactions.

APPLICATION FOR MEMBERSHIP.

13. All applications for membership must be made upon the application blank of the Association.

14. Persons not members, having prepared papers to be presented at the meetings of the Association, shall be proposed for membership at the first business session of the Association.

EXPENDITURES.

15. All bills connected with the publication of the transactions shall, upon the approval of the chairman of the Publication Committee and the Secretary, be signed by the President of the Association, and paid by check of the Treasurer directly to the party concerned; and the President shall not approve any bill relating either to publishing or printing without the approval first of the chairman of the committee in charge thereof.

16. Bills for current expenses shall be first approved by the Secretary, then sent to the President, and on his approval they shall be paid by check of the Treasurer directly to the parties interested.

17. The actual and necessary travelling expenses of the Secretary and Treasurer to the annual meeting of the Association, and to one meeting of the Executive Committee, shall be classed as current expenses.

RESOLUTIONS.

18. All resolutions presented to the Association shall be sent to the Chair in writing, and referred to a committee without discussion.

ARREARAGES.

19. The arrearages of all members remitting their dues for two years shall be cancelled up to the date of the last payment, but they shall be entitled to the transactions of the Association only for the years for which they have actually paid.

AUDITING COMMITTEE.

20. An Auditing Committee shall be appointed by the Chair to audit the accounts of the Treasurer, and report upon the same.

OFFICERS AND COMMITTEES

OF THE

AMERICAN PUBLIC HEALTH ASSOCIATION.

ORGANIZATION, 1888–1889.

President, ...	Dr. HOSMER A. JOHNSON, *Chicago, Ill.*
First Vice-President, .	Dr. JEROME COCHRAN, *Montgomery, Ala.*
Second Vice-President,	Dr. FREDERICK MONTIZAMBERT, *Quebec, Canada.*
Secretary, ...	Dr. IRVING A. WATSON, *Concord, N. H.*
Treasurer, ...	Dr. J. BERRIEN LINDSLEY, *Nashville, Tenn.*

(*Ex-officio* Members Executive Committee.)

STANDING COMMITTEES.

EXECUTIVE COMMITTEE.

(Elective.)

Dr. HENRY B. BAKER	*Lansing, Mich.*
Dr. SAMUEL H. DURGIN	*Boston, Mass.*
Dr. J. N. McCORMACK	*Bowling Green, Ky.*
Dr. WALTER WYMAN	*Baltimore, Md.*
Dr. J. F. KENNEDY	*Des Moines, Iowa.*
Dr. PETER H. BRYCE	*Toronto, Ont.*

(The ex-Presidents, *ex-officio* members Executive Committee.)

Dr. STEPHEN SMITH	*New York City.*
Dr. JOSEPH M. TONER	*Washington, D. C.*
Dr. JOHN H. RAUCH	*Springfield, Ill.*
Prof. JAMES L. CABELL	*University of Virginia, Va.*
Dr. JOHN S. BILLINGS	*U. S. Army.*
Prof. ROBERT C. KEDZIE	*Lansing, Mich.*
Dr. EZRA M. HUNT	*Trenton, N. J.*
Dr. ALBERT L. GIHON	*U. S. Navy.*
Dr. JAMES E. REEVES	*Chattanooga, Tenn.*
Dr. HENRY P. WALCOTT	*Cambridge, Mass.*
Dr. GEORGE M. STERNBERG	*U. S. Army.*
Dr. CHARLES N. HEWITT	*Red Wing, Minn.*

ADVISORY COUNCIL.

Alabama, ...	Dr. JOHN C. DOZIER, *Birmingham.*
Arkansas, ...	Dr. H. C. DUNNAVANT, *Osceola.*
California, ...	Dr. HENRY S. ORME, *Los Angeles.*
Colorado, ...	Dr. CHARLES AMBROOK, *Boulder.*
Connecticut, ...	Dr. RALPH S. GOODWIN, *Thomaston.*
Dakota, ...	Dr. O. WELLINGTON ARCHIBALD, *Jamestown.*

Delaware,	Dr. LEWIS P. BUSH, *Wilmington.*
Florida,	Hon. HARRISON REED, *Jacksonville.*
Georgia,	Dr. LOUIS A. FALLIGANT, *Savannah.*
Illinois,	Dr. RALPH E. STARKWEATHER, *Chicago.*
Indiana,	Dr. JOHN N. TAYLOR, *Crawfordville.*
Iowa,	Dr. A. W. CANTWELL, *Davenport.*
Kansas,	Dr. DANIEL C. JONES, *Topeka.*
Kentucky,	Dr. WILLIAM BAILEY, *Louisville.*
Louisiana,	Dr. LUCIEN F. SALOMON, *New Orleans.*
Maine,	Dr. FREDERICK H. GERRISH, *Portland.*
Maryland,	Dr. JOHN MORRIS, *Baltimore.*
Massachusetts,	Dr. ALBERT R. RICE, *Springfield.*
Michigan,	Dr. VICTOR C. VAUGHAN, *Ann Arbor.*
Minnesota,	Dr. DANIEL W. HAND, *St. Paul.*
Mississippi,	Dr. WIRT JOHNSTON, *Jackson.*
Missouri,	Dr. GEORGE HOMAN, *St. Louis.*
New Hampshire,	Dr. GEORGE COOK, *Concord.*
New Jersey,	Dr. EZRA M. HUNT, *Trenton.*
New York,	Dr. JOHN GRIFFIN, *Brooklyn.*
North Carolina,	Dr. THOMAS F. WOOD, *Wilmington.*
Ohio,	Dr. CHARLES O. PROBST, *Columbus.*
Pennsylvania,	Mr. CROSBY GRAY, *Pittsburgh.*
Rhode Island,	Col. GEORGE E. WARING, Jr., C. E., *Newport.*
South Carolina,	Dr. HENRY B. HORLBECK, *Charleston.*
Tennessee,	Col. D. P. HADDEN, *Memphis.*
Texas,	Dr. ROBERT RUTHERFORD, *Houston.*
Vermont,	Dr. A. P. GRINNELL, *Burlington.*
Virginia,	Dr. J. GRATTAN CABELL, *Richmond.*
West Virginia,	Dr. C. T. RICHARDSON, *Charleston.*
Wisconsin,	Dr. SOLON MARKS, *Milwaukee.*
Dist. of Columbia,	D. E. SALMON, D. V. M., *Washington.*
U. S. Army,	Dr. CHARLES SMART, *Washington, D. C.*
U. S. Navy,	Medical Director ALBERT L. GIHON, *Brooklyn, N. Y.*
U. S. M. H. Service,	Dr. JOHN GODFREY, *Chicago, Ill.*
Dominion of Canada,	Dr. CHARLES W. COVERNTON, *Toronto.*
Province of Ontario,	Dr. PETER H. BRYCE, *Toronto.*
Province of Quebec,	Mr. HENRY R. GRAY, *Montreal.*
Manitoba,	Dr WM. R. D. SUTHERLAND, *Winnipeg.*
New Brunswick,	Dr. WM. S. HARDING, *St. John.*

PUBLICATION COMMITTEE.

THE SECRETARY, *ex-officio.*

Dr. ALFRED F. HOLT . . . . *Cambridge, Mass.*
Dr. GRANVILLE P. CONN . . . . *Concord, N. H.*

SPECIAL COMMITTEES.

ON STATE BOARDS OF HEALTH.

Dr. EMMANUEL P. LACHAPPELLE, President Provincial Board of Health of Quebec.
Dr. HENRY P. WALCOTT, President State Board of Health of Massachusetts.
Dr. JAMES T. REEVE, Secretary State Board of Health of Wisconsin.
Dr. FRANKLIN STAPLES, Member State Board of Health of Minnesota.

Dr. George Homan, Secretary State Board of Health of Missouri.
Dr. Charles O. Probst, Secretary State Board of Health of Ohio.
Dr. Thomas F. Wood, Secretary State Board of Health of North Carolina.
Dr. Gerard G. Tyrrell, Secretary State Board of Health of California.
Dr. Lewis Balch, Secretary State Board of Health of New York.
Dr. Clement P. Wilkinson, President State Board of Health of Louisiana.

ON THE POLLUTION OF WATER-SUPPLY.

Dr. Charles Smart, U. S. A. . . . . Washington, D. C.
Dr. A. G. Young . . . . Augusta, Maine.
Dr. Victor C. Vaughan . . . . Ann Arbor, Mich.
Dr. John H. Rauch . . . . Springfield, Ill.
Prof. W. W. Daniells . . . . Madison, Wis.

ON THE DISPOSAL OF GARBAGE.

Dr. Samuel S. Kilvington . . . . Minneapolis, Minn.
Crosby Gray, Esq. . . . . Pittsburgh, Pa.
Dr. Oscar C. DeWolf . . . . Chicago, Ill.
Dr. Louis Laberge . . . . Montreal, P. Q.
Dr. Henry H. Clark . . . . McGregor, Iowa.
Dr. Edward Clark . . . . Buffalo, N. Y.
Dr. Granville P. Conn . . . . Concord, N. H.
Dr. John Coventry . . . . Windsor, Ont.

ON ANIMAL DISEASES AND ANIMAL FOOD.

D. E. Salmon, D. V. M. . . . . Washington, D. C.
Dr. Ezra M. Hunt . . . . Trenton, N. J.
Prof. James Law . . . . Ithaca, N. Y.
Dr. Henry F. Hoyt . . . . St. Paul, Minn.
V. T. Atkinson, D. V. M. . . . . Milwaukee, Wis.

ON FORMS OF STATISTICS.

Dr. Henry B. Baker . . . . Lansing, Mich.
Dr. Samuel W. Abbott . . . . Wakefield, Mass.
Dr. Benjamin Lee . . . . Philadelphia, Penn.
Dr. Charles A. Lindsley . . . . New Haven, Conn.
Dr. Roscoe N. Jackson . . . . Faribault, Minn.
Hon. Dr. Paquet . . . . St. Cuthbert, P. Q.
Prof. W. W. Payne . . . . Northfield, Minn.

ON INCORPORATION.

Dr. Hosmer A. Johnson, *President* . . . . Chicago, Ill.
Dr. Irving A. Watson, *Secretary* . . . . Concord, N. H.
Dr. J. Berrien Lindsley, *Treasurer* . . . . Nashville, Tenn.
Maj. Charles Smart, U. S. A. . . . . Washington, D. C.
Dr. J. H. Baxter, U. S. A. . . . . Washington, D. C.
Surgeon-General John M. Browne, U. S. N. . . . . . Washington, D. C.
Dr. Smith Townshend . . . . Washington, D. C.
Samuel A. Robinson, Esq. . . . . Washington, D. C.

ON PROTECTIVE INOCULATIONS IN INFECTIOUS DISEASES.

Dr. GEORGE M. STERNBERG, U. S. A. . . . . Baltimore, Md.
Dr. HENRY P. WALCOTT . . . . Cambridge, Mass.
Prof. WILLIAM H. BREWER . . . . New Haven, Conn.
Dr. WILLIAM T. COUNCILMAN . . . . Baltimore, Md.

ON RESOLUTIONS IN RELATION TO COMMISSIONER OF HEALTH.

Dr. HENRY P. WALCOTT . . . . Cambridge, Mass.
Col. J. M. KEATING . . . . Memphis, Tenn.
Dr. J. N. McCORMACK . . . . Bowling Green, Ky.
Dr. J. BERRIEN LINDSLEY . . . . Nashville, Tenn.
Surgeon-General JOHN M. BROWNE, U. S. N. . . . . . . Washington, D. C.

ON SANITARY AND MEDICAL SERVICE ON EMIGRANT SHIPS.

Dr. SAMUEL H. DURGIN . . . . Boston, Mass.
Medical Director ALBERT L. GIHON, U. S. N. . . . . Brooklyn, N. Y.
Dr. FREDERICK MONTIZAMBERT. . . . . Quebec, P. Q.

LOCAL COMMITTEE OF ARRANGEMENTS.

Dr. JOSEPH H. RAYMOND . . . . Brooklyn, N. Y.
Dr. STEPHEN SMITH . . . . New York city.

(With power to select other members.)

LIST OF MEMBERS ELECTED AT THE SIXTEENTH ANNUAL MEETING OF THE AMERICAN PUBLIC HEALTH ASSOCIATION, HELD AT MILWAUKEE, WIS., NOVEMBER 20-23, 1888.

ACTIVE.

Dr. CHARLES LINNAEUS ALLEN, Secretary State Board of Health, 31 North Main St.. . . . . Rutland, Vt.
Dr. O. WELLINGTON ARCHIBALD, Superintendent North Dakota Hospital for the Insane . . . . Jamestown, Dakota.
V. T. ATKINSON, V. S., State Veterinarian, 563 Milwaukee St. Milwaukee, Wis.
Dr. HENRY I. BAHNSON, Member Board of Health . . . . . . Salem, N. C.
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AMERICAN PUBLIC HEALTH ASSOCIATION,

1889.

This list includes those who have maintained their membership to the present time, excepting those elected at Milwaukee, which will be found in another place. The secretary should be notified of any errors or omissions.

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*Edwin M. Snow, M. D.	1876.
John H. Rauch, M. D.	1877.
*Elisha Harris, M. D.	1878.
James M. Cabell, M. D.	1879.
John S. Billings, M. D.	1880.
*Charles B. White, M. D.	1881.
Robert C. Kedzie, M. D.	1882.
Ezra M. Hunt, M. D.	1883.
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James E. Reeves, M. D.	1885.
Henry P. Walcott, M. D.	1886.
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Charles N. Hewitt, M. D.	1888.
Hosmer A. Johnson, M. D.	1889.

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James Allison, Esq.	Cincinnati, O.	1884.
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Dr. Charles Ambrook	Boulder, Col.	1878.
Dr. Azel Ames, Jr.	Chicago, Ill.	1875.
Dr. A. A. Ames	Minneapolis, Minn.	1887.
George T. Angell, Esq.	Boston, Mass.	1878.
Dr. S. T. Armstrong, U. S. M. H. S.	New York City.	1882.
Dr. J. S. Arwine	Columbus, Ind.	1882.
Dr. G. C. Ashmun	Cleveland, O.	1881.
Dr. A. B. Atherton	Toronto, Ont.	1886.
Decatur Axtell, Esq.	Richmond, Va.	1885.
Dr. William Bailey	Louisville, Ky.	1879.
Dr. P. H. Bailhache, U. S. M. H. S.	Philadelphia, Pa.	1874.

* Deceased.

Dr. GEORGE BAIRD	Wheeling, W. Va.	1886.
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EDWARD BAUSCH, Esq.	Rochester, N. Y.	1884.
Dr. J. H. BAXTER, U. S. A.	Washington, D. C.	1876.
Dr. WITTER J. BAXTER	Janesville, Mich.	1883.
Dr. WILLIAM BAYARD	St. John, N. B.	1886.
Dr. D. H. BECKWITH	Cleveland, O.	1884.
Dr. HENRY E. BEEBE	Sidney, O.	1882.
Dr. A. N. BELL	New York City.	1872.
Dr. A. C. BERNAYS	St. Louis, Mo.	1884.
Dr. J. J. BERRY	Portsmouth, N. H.	1886.
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Dr. JOHN E. BLACK	Memphis, Tenn.	1887.
Dr. EMILY BLACKWELL	New York City.	1873.
Dr. E. W. BLATCHFORD	Chicago, Ill.	1876.
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G. P. BROWN	Chicago, Ill.	1885.
Dr. T. M. BROWN		1887.
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Dr. LEWIS P. BUSH	Wilmington, Del.	1879.
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Prof. JAMES L. CABELL	University of Virginia, Va.	1872.
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Dr. IRVING H. CAMERON	Toronto, Ont.	1886.
Dr. HENRY F. CAMPBELL	Augusta, Ga.	1879.
Dr. WILLIAM CANNIFF	Toronto, Ont.	1883.
Dr. G. M. D. CANTRELL	Hope, Ark.	1881.
Dr. A. W. CANTWELL	Davenport, Ia.	1880.
Dr. J. L. CARTER	Dallas, Tex.	1880.
Prof. STANFORD E. CHAILLÉ	New Orleans, La.	1874.
Dr. WILLIAM M. CHAMBERLAIN	New York City.	1885.
Dr. CHARLES W. CHANCELLOR	Baltimore, Md.	1875.
Dr. J. EDGAR CHANCELLOR	Charlottesville, Va.	1881.
Prof. C. F. CHANDLER	New York City.	1872.
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Dr. P. S. Conner	Cincinnati, O.	1884.
Dr. George Cook	Concord, N. H.	1885.
Dr. W. C. Cook	Nashville, Tenn.	1879.
George W. Cooley, C. E.	Minneapolis, Minn.	1887.
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Dr. John Coventry	Windsor, Ont.	1886.
Dr. Charles W. Covernton	Toronto, Ont.	1884.
Dr. T. S. Covernton	Toronto, Ont.	1885.
Dr. George M. Cox	Springfield, Mo.	1884.
Dr. G. G. Craig	Rock Island, Ill.	1880.
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Dr. J. W. Craig	Mansfield, O.	1884.
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Dr. Joseph Holt	Portland, Oregon.	1880.
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Dr. George Homan	St. Louis, Mo.	1879.
Dr. Louis D'Homergue	Brooklyn, N. Y.	1887.
Dr. H. B. Horlbeck	Charleston, S. C.	1880.
Dr. Asa Horr	Dubuque, Iowa.	1872.
Dr. Carl H. Horsch	Dover, N. H.	1883.
Dr. Henry F. Hoyt	St. Paul, Minn.	1884.
Dr. Hughes	Lindsay, Ont.	1866.
Dr. Ezra M. Hunt	Trenton, N. J.	1872.
Dr. H. M. Hurd	Pontiac, Mich.	1883.

Dr. W. F. Hutchinson	Providence, R. I.	1886.
Dr. Woods Hutchinson	Des Moines, Iowa.	1886.
Dr. Andrew Imerie	Detroit, Mich.	1885.
Mark H. Irish	Toronto, Ont.	1886.
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Dr. Andrew J. B. Jenner	Detroit, Mich.	1883.
Dr. Hosmer A. Johnson	Chicago, Ill.	1872.
Dr. Sam C. Johnson	Hudson, Wis.	1884.
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Dr. E. Utley Jones	Taunton, Mass.	1881.
Dr. H. Isaac Jones	Scranton, Mass.	1880.
Nicholas Jones	Pittsburgh, Pa.	1886.
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Dr. H. W. Kitchen	Cleveland, O.	1881.
Charles F. Klayer, Esq.	Cincinnati, O.	1881.
Dr. William F. Knox	McKeesport, Pa.	1887.
Dr. A. J. Koiner	Roanoke, Va.	1885.
Dr. Cornelius Kollock	Cheraw, S. C.	1884.
Emil Kuichling, C. E.	Rochester, N. Y.	1882.
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Dr. Emmanuel P. Lachapelle	Montreal, P. Q.	1887.
Dr. J. W. Lambert	St. Louis, Mo.	1885.
Dr. S. W. Latta	Philadelphia, Pa.	1885.
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Dr. Samuel L. Ledbetter	Birmingham, Ala.	1887.
Dr. Benjamin Lee	Philadelphia, Pa.	1874.
Hon. James E. Lee, Jr.	Memphis, Tenn.	1887.
Dr. William Lee	Washington, D. C.	1874.
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